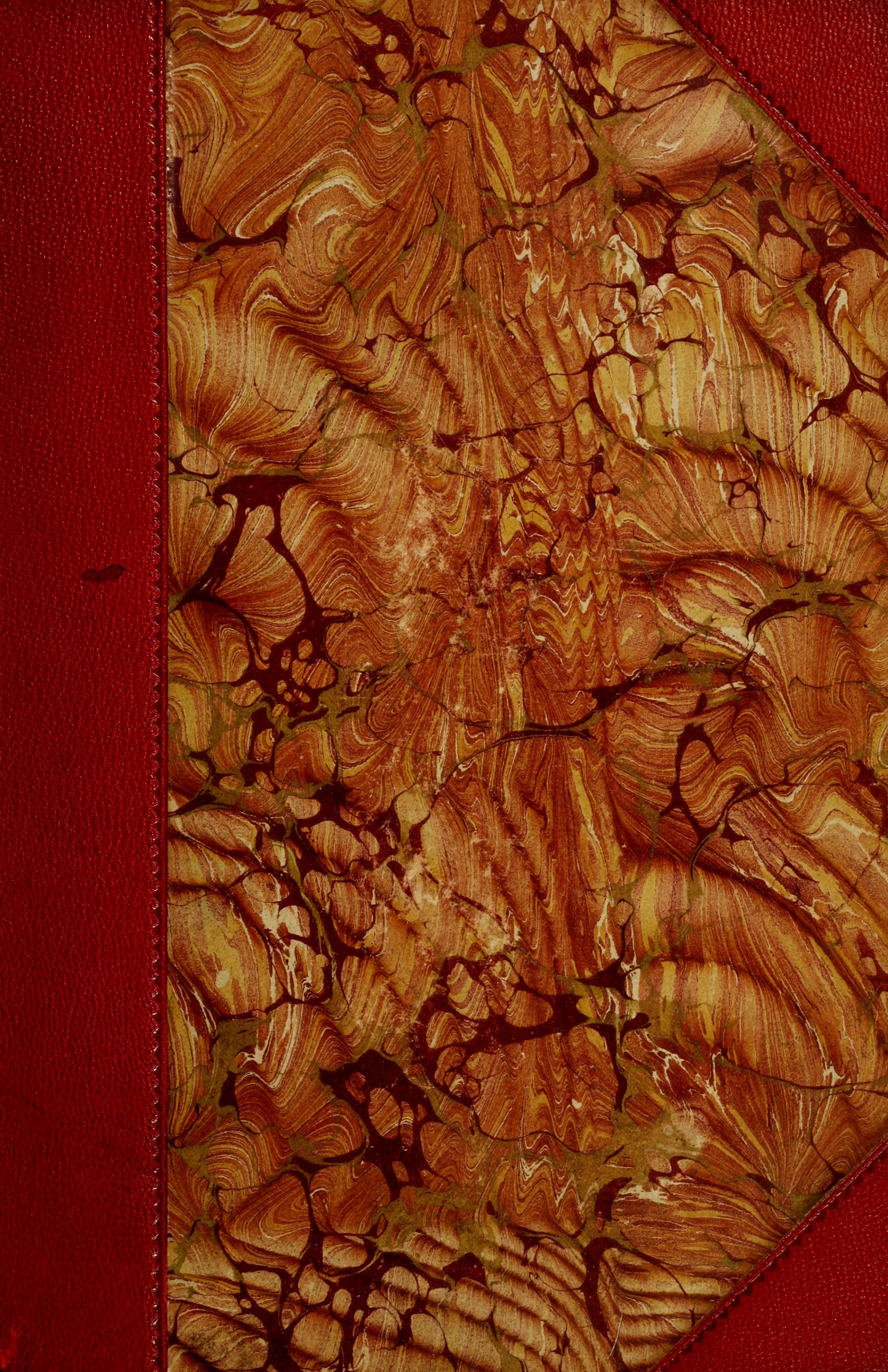

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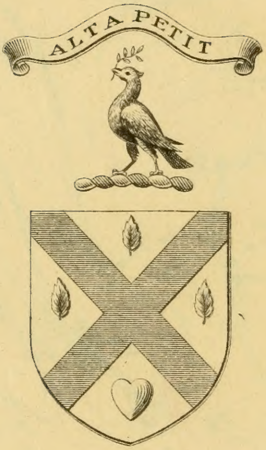

A. McL. Marshall

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JOURNAL

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

EDITED BY

R. A. STERNDALE.
and
H. M. PHIPSON.

VOLUME II.

1887.

*Consisting of Four Numbers and containing
Eleven Illustrations.*

Bombay:
PRINTED AT THE
EDUCATION SOCIETY'S PRESS BYCULLA.

1887.

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ERRATA.

At p. 115, Col. 2, l. 7 of order 27, *for* "longana" *read* "Longana."

,, ,, 116, Col. 2, *for* the second "Bauhinia" under order 30, *substitute* double commas.

,, ,, 120, Col. 2, l. 3, of order 54, *for* "petiolaret" *read* "petiolare."

,, ,, 124, Under order 75, *dele* the seventh and eighth entries (*i.e.* of two plants of the genus *Phyllanthus*), and

,, ,, 125, *insert* the following as the last entry under order 75—

" ,, ... ,, Madraspatana— | —Kanocha."

,, ,, 126, Col. 2, l. 2 of order 83, *for* "Cirnum" *read* "Crinum".

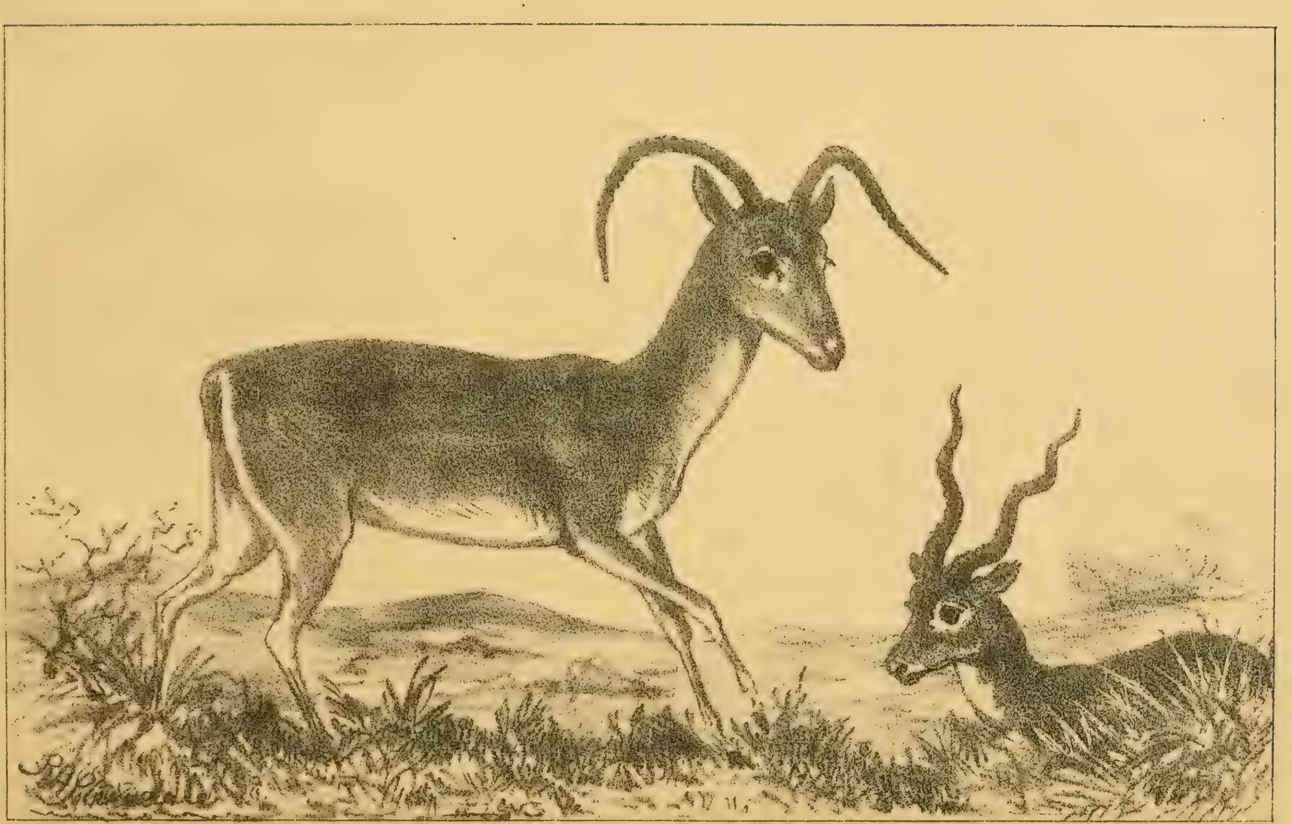
,, ,, 127, Col. 2, l. 8 of order 96, *for* "terminaris" *read* "terminans."

,, ,, 127, Col. 2, last line but two from bottom of page, *for* "fulcatum" *read* "falcatum."

,, ,, 128, Transfer the last two entries from order 99 to order 96.

N
Westm
Wilson
Wise,
Wise,
Woodw
Wroug
Wylie,

Yeld,
Yerbur
Young
Young



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Natural History Society.

No. 1.] BOMBAY, JANUARY 1887. [Vol. II.

WATERS OF WESTERN INDIA.

Part III.—The Konkan and Coast.

(By a Member of the Society.)

The remaining Reptiles of the Region are all Batrachians. The Frogs are much the same as in the few damp parts of the Deccan, but more numerous. The Cœcilians, or blind-worms, are rather rare; and I do not think that there are any newts. Singularly enough, the name "niwta" is applied to certain leaping-fishes, which will be dealt with in their own place; and which, seen at a little distance in their native mud, have very much the appearance and action of reptiles.

The fishes, naturally, are numerous and important, and I shall take them in order; following usually the classification of Dr. Day, unquestionably the standard authority on Indian fishes.

The family of Perches is only represented in the fresh waters by few and small (though often prettily marked) species, chiefly of *Ambassis*. The so-called climbing Perch (*Anabas scandens,*) belongs to another family, although decidedly perch-like in appearance; I have not procured it in the Konkan myself.

The marine Perches, however, are very numerous and important here, as throughout the tropical and sub-tropical seas, in which, to a great extent, they assume the place (and very often the name) of the northern Cod family, here represented only by a few small species. Where you find "rock-cod," "cod-sounds," or "cod-roes" in tropical trade, the term generally refers to one of these perches, or to some related spiny-finned fish.

They do not seem to affect the depths of the ocean, but haunt banks or reefs, from the shore to about 200 fathoms, feeding, as a rule, not very far from the bottom.

The commonest here are small rock-perches, called on Bombay tables "stone-fish," of which the best, perhaps, is the "Cock-up fish," *Lates calcarifer*. This is a fish chiefly of the estuaries, and, where permitted, it comes some way above highwater mark, and lives for some time in fresh water. An allied species, the "Kargota," or "belt-fish" (*Therapon Jarbua*), is often kept in wells by the natives, and seems to thrive there as well as in the sea. It is a handsome little fish, with deep brown bands on a whitish ground, which in sunlit water look black and gold.

The natives call most of these rock-perches "Gobra," or "Gobri," from the dull olive colours of one or two taken by them as types which they compare to the colour of cowdung (gobar or govar).

Most of the commonest belong to the genera *Serranus* and *Lutianus*, and a few, such as *Serranus Malabaricus*, attain a very large size; but these are not often seen on European tables. *Serranus Bœnack* ("Bhui-nak" = "chief-fisherman,") is prettily marked with sky blue, and some others have brilliant colours, but these are not very common in the waters of the coast, usually more or less dull with mud.* The *Lutiani* are more commonly bright coloured than the *Serrani*; and, in my experience, keep further off shore. One of them (*Lutianus Argentimaculatus*, I think,) is mentioned and figured by Mr. Thomas as a fish giving sport with the rod in his region. It is a very fine fish, of a deep cherry colour when mature, and grows to at least 15 lbs. weight. A very closely allied species, *L. roseus*, is the "red rock-cod," of the Straits Settlement. All these perches are very fair eating when fresh. I shall take here, somewhat out of turn, the *Sciænas*, called by the natives "Gul" or "rose" fish, I suppose from a faint pink blush which they have on death. Some Europeans in Bombay call them "buffalo-fish," which I have noted above as a Deccan name for the Mahseer.

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* Some Serrani are said to present the curious phenomena of perfect milt and roe normally developed in the same fish.

Similarly the red sea perches are called on the coast "*Tambe,*" or "copper fish," which above ghat is the name of the Roho.

The "Red Sea Salmon" of steamer's cooks is a *Sciœna,* and so is the "Canal Mullet," sometimes caught when ships pass a night in the Suez Canal. The *Sciœnas* generally are but coarse fish, compared to those mentioned above; but they grow to 5 and 6 feet long. They, and many of the larger sea perches, yield isinglass, which goes abroad under the name of "cod-sounds."

The next family, the *Squamipinnes,* is much less important in number and size, either of species or individuals. Several of its members, however, are remarkable for their strange forms, bright colours, or handsome markings, as the long-snouted *Chœtodons,* and the "Warra" (*Scatophagus Argus*) "spotted like the pard." Most of these fishes have somewhat the shape of a pomflet, that is, they are "flat-fish" *on a dish*; but *deep* fish in the water. They are, however, squarer about the shoulder, breast, and flanks than, the pomflets, and much inferior in size and in flavour.

The next family is that of the *Mullidœ*; or Red Mullets, which should be distinguished from the grey mullets. There are no true red mullets, I am sorry to say, on our coast; so my chapter on them is like that on snakes in Iceland.

They are represented here by some poor relations of the genera *Mulloides* and *Upeneus,* small and scarce, but brightly coloured. I have not myself obtained any specimens. The next two families have few important genera except *Chrysophrys,* of which one species, *C. berda,* a fine perch-like fish, is the "black rock-cod" of the Madras side; and passing over a lot of fishes of "merely academical interest," the next family worth notice is that of the *Scorpœnidœ,* which are about as eccentric in shape and colour as anything in the sea. Their chief representative here is the "Kombada," or "cock-fish" (*Pterois Russellii*), a handsome fish, banded scarlet, and black, and provided with huge fins that look as if they had been "torn in a scuffle." We have specimens in our Museum; unluckily the colours are not permanent in spirits. The "Kombada" sometimes reaches 15 inches long, and is certainly the showiest fish of our coast.

The Mango-fishes (*Polynemidœ*), famous on the Bengal side of the punkah, have little reputation here. The reason is, probably, that the pick of the basket, *Polynemus paradiseus,* is "anadromous," *i.e.,* it runs up rivers to spawn; and there are in the Konkan no rivers suitable for that purpose. If the matter were taken up at the mouth of the Tapti or Nerbudda, very likely the fish might be got in good season there. The Maratha name is "Chela" (= "disciple") which corresponds to the Bengal "Tapasi," said to mean a hermit or penitent. The large *Polynemi* are here called "Ráwas," and are very fair eating, though not in the first class.

The next is a remarkable family, the Sword-fishes, represented here by at least one species, *Histiophorus brevirostris*, called in Maratha "Tár-mása," or "Wire-fish," probably from the filiform ventral appendages; and also (according to an unsigned MS. note in my office copy of Day) "Már-mása," or "the striker," which seems more appropriate. In this fish the upper jaw, or snout, is not so long as in the Atlantic Xiphias, or even in some of its own congeners; but there is quite enough of it to make a very formidable weapon, as its length from the gape appears to be about $\frac{2}{9}$ of the total length of the fish, which sometimes exceeds 10 feet. That it is used as a weapon is proved by many instances; but in particular there is in our Museum a "sword" of this species which I myself found sticking in the left hind-leg-socket of a turtle (*Cawana olivacea*), brought to me alive. Not only *malice prepense*, but considerable cunning of fence, were required to inflict this wound. Judging by proportions, the sword-fish must have been lighter than the turtle (not a large specimen), and it is not easy to see what he could expect to do with the latter when dead.

After the Sword-fishes, quaintly enough, come Scabbard-fishes (*Trichiuridæ*), long thin creatures like silver streamers, fancifully supposed to resemble a steel regulation scabbard. They are very good eating when fresh, but are chiefly used here for drying without salt in the sun, for which their shape fits them well. They live on the top of the water, sometimes in great numbers, and are much preyed up by sea-fowl. Sometimes they will jump into a boat, like the Garfishes.

The next family, *Carangidæ*, contains one very notable little fish, the "pilot-fish," who is supposed to take charge of sharks, ships, or any other large things that he considers unable to take care of themselves. I have not got any specimens here. One species of *Caranx*, very common, pretends to be a mackerel, and two or three to be pomflets, but the resemblance is external only. They are branded by the natives with the titles of "Chor-wágada" and "Chor (thief) Sarga." Accordingly the true pomflets (*Stromateus*) come immediately after them, and require little description in Bombay. The native name for the white pomflet is "Sarga," and for the black "Halwa." The Portuguese name is "Pumpano," and a fish of this name is a delicacy in the American "Gulf States" and is brought in ice to New York, where it looks and tastes very much as a pomflet does in Poona. Whether it is a true *Stromateus* or not I cannot say. The "Pumpano" was mentioned as a good fish of this coast by Van Linschoten in the sixteenth century. It may be worth while to remark that it is not a flat-fish in the same sense as turbots and soles are, but swims upright on edge like a John Dorey, which, indeed, is also more like a pomflet in flavour than any other fish of Northern Seas.

The monsoon fishery for both pomflets, but especially the black, is conducted on the Bombay coast at considerable risk; large open "machwas" (fishing smacks) remaining out of sight of land often for two or three days. Great care is shown in fitting out these boats, and they carry double or treble crews, but their return is always awaited with anxiety, and the fish are as much "lives o' men" as any herring in the North Sea. (Query, "pomfret" or "pomflet"?) Pretty close to the pomflets, though more nearly allied to the next family, are the so-called "Dolphins," of modern sea-folk, famous for changing colour in dying. They are oceanic fish, and not common here. I have no specimens from this coast, nor any vernacular name for them. I need hardly say that the classic Dolphin was a *porpoise*.

I have dined in Bombay, off and on, for eighteen years without ever seeing a mackerel on table there, and a great many people who find "cod" all over the world would tell you that there are no mackerel here. The fact is, however, that a mackerel closely resembling the British species is common near Bombay in the cold weather, and has very much the habits of its northern relative, especially that of playing in schools on the surface. Only, it will not here take any sort of a trailing bait or fly; nor have I ever been able to catch any sea fish near Bombay by that most sporting method. It is said to answer well enough down the coast. The Indian mackerel (*Scomber microlepidotus*) is smaller than the British fish, seldom reaching one foot long; when fresh it is a very good fish indeed, but keeps badly.

It is taken in seines all along the coast, on the flat strands, and must, I should think, often be so taken in Back Bay; and there I should advise any one who wants a Bombay mackerel to look out for it. The Maratha name is "Wágada."

The large mackerels, or tunnies, *Thynnus*, *Pelamys*, and *Cybium*, mostly keep to deep water, and come to us under the general name of "Sur-mahi," (Persian = "Red-fish,") which we render "Seer-fish," as a very tolerable substitute for salt cod and salmon. One species, *Cybium guttatum* is said to reach 6 feet long, and they are all reported to take a trailed bait or fly well in the offing, so that they will afford sport to the generation of yachtsmen who shall learn to sail outside the harbour. The last genus of the mackerels is *Echeneis*, containing the curious sucking-fish, called on this coast "Sakála" (*E. Neucrates*), and "Luchung," (*E. albescens*). Of these, under the name of "Chazo," it has lately been written that the Zanzibar fishermen put a ring on their tail with a line in it and send them forth to attach themselves to big fish by the curious sucker on the top of the head. No one here utilizes them in this remarkable manner, though their habit of "getting a lift" from other fishes is well known. The yarn had been spun before about some South American fishermen, but with less detail and authority, and it was not then very generally believed. At present, though no European has actually seen this fishery, the evidence is good enough for a strong probability, and there is some of a similar practice in Madagascar with a fish, probably allied, called "Tarudu." The Albacores, Bonitos, and "Spanish" Mackerel of the Atlantic are all *Scombridæ* (Mackerels).

The next family, *Uranoscopidæ*, are about as unlike the graceful and beautifully coloured mackerels as anything can be. They are represented here by the "Yekru" (*Ichthyscopus inermis*), a deformed and blotchy creature, best described in Dr. Day's words, "It made a curious noise, half snapping and half croaking."

But the *Trachinidæ*, which follow, have a fine slender form, a good flavour, and a pretty name; for two or three of their genus *Sillago* are known in India as "lady fishes." I am not sure whether the name is a compliment to the shape of the fish, or to its nutritive qualities, which recommend it in native medicine, to ladies in (or just out of) "an interesting condition." It is quite as good for the most uninteresting of their worser halves; it tastes like an English smelt, and therefore, I suppose, some people call it a "whiting." The Maratha name is "Murdi" The *Sillagos* are fish of the sand, and of shallow waters, where they are usually taken with the seine, or with small nets.

Passing over a small and uninteresting family (*Pseudochromides*) we come to the *Batrachidæ*, or toad-fishes. Ours are only remarkable for ugliness and size (reaching 3 feet long), but an American Pacific species (*Thalassophryne reticulatus*) is probably alone among fishes in possessing a blood-poisoning apparatus inferior in degree only to that of a venomous snake. The operculum or gill cover has a long tubular spine with a poison-sac at its base, containing a venom supposed to be secreted in the muciferous channels, and capable of causing fever, though apparently no more.

The attention devoted to this remarkable fish may help us hereafter with other "sting-fishes." Most practical fishermen believe in a specific poison in the wounds inflicted by various species, especially the northern "Piky Dog-fish" (*Spinax*), and some tropical Siluroids. The effects are far too severe to be due to the mere laceration of the most serrated spine, and it is probable that the mucus is more or less poisonous.

In a similar way the secretions of the skin of some otherwise harmless reptiles (especially, according to Mr. Murray, the Sind "biscobra," *Eublepharis Hardwickii*) are certainly capable of causing irritation to the epidermis, *à fortiori* more if inoculated.

An European member of one of the following families, *Cottus scorpio* of the *Cottidæ*, is much dreaded at home on this very score; inflicting injuries altogether out of proportion to the size of its little prickles. Passing over these and one or two others, we come to the Gobies, very numerous and interesting to people who know more about them already than I can write here, or perhaps anywhere. They are small, often brightly coloured, or at least well marked, and "too numerous to mention." There are however, two goggle-eyed genera, which are really among the wonders of the coast. *Periopthalmus* and *Boleopthalmus*, the leaping fishes or "mud fish" of the tidal waters. The Marathas call those which frequent muddy creeks "Niwte" and those of rocky shores "Kharba." The former may be seen, whenever the tide is out, crawling in myriads over the mud, getting in and out of each other's way in the most ludicrous fashion, and all disappearing in the mud as by magic, when alarmed. *B. Boddaerti* is our commonest here. It has bright blue spots. Those of the rocks, which are mostly *Periopthalmi*, are very provoking to any one hunting the tidal pools for specimens.

Just as the prey seems to be penned up in a corner behind the hand-net, hop-skip-and-a-jump, he is in another puddle five or six yards away, and he always does jump for that next puddle, and never out on dry rock.

The way to fix him is to have two hand-nets and lay one of them over puddle No. 2 before beating up his quarters in No. 1. I have seen one of these little fishes deliberately follow a bait, which I slowly withdrew from him, about 2 feet up a rock. Some kept in an aquarium preferred, apparently, to be out of water, or at least half-out, and would remain so for hours without moving. They are very tolerable eating, when well washed inside and out or after keeping for a few hours in clean sea-water.

For the next family, the Blennies, I can do no better than borrow Major Beavan's statement that they "are a most ferocious lot of little fishes, they reside mostly on or near the bottom; some of the species are remarkable for producing their young alive." Ours vary very much in form; some (*Eleotris*) are eel-like, of a dirty pink colour, and very ugly; others are smart little fishes, well-finned.

After them come the "Spiny Eels," well known on all Mofussil breakfast tables as "Bhàm Machi," and generally called in English "Eels," though they are not really eels at all, in nature or flavour. For the benefit of readers who may have seen them only on the dish, I may remark that they have a queer proboscis like that of a tapir, many prickles on the back, and few on the belly. They are exclusivly fresh water fish, and can be taken with a worm, a bit of raw meat or almost any other animal bait.

Several Atherines, or sand-smelts, are recorded; but I have got none of them here, which is probably my own fault—and misfortune, as the whole family are good to eat.

The Grey Mullets, to be carefully distinguished from the Red Mullets, abound in the creeks along the shore, and when fresh and in good condition, are as good for the table as any fish we have. They are generally known as "Bhui Mása" or "Fisherman fish" and a very good and handsome striped species (*Mugil œur*) as "Thoda." This last reaches a yard in length. I have never found a bait for them, though I have *read* of many.

The next two families are small and uninteresting here, except that one fish, *Fistularia Serrata,* happens to have a long central tail ray, which, being transferred to the tail of another fish by accident or design (in a collection) helped to get up a bogus "new species," and a very pretty quarrel upon the merits. It is not common.

The "Snake-headed" Murrells are the same here as in the Deccan. These fish, indeed, vary little throughout India, as might be expected from their power of passing overland. They are exclusively freshwater fishes.

The next family, *Labyrinthici,* includes the "climbing perch," which I have not got here, but it may reasonably be looked for. Dr. Day's account of the dangers of this fish, and the remedy, is sufficiently original to be well worth transcribing. "Accidents are constantly occurring, due to native fishermen killing these fishes * * by a bite. While the fish is in the fisherman's mouth for this humane purpose (as it is covered by a slimy, slippery secretion) it occasionally slips into his throat, then owing to its spiny character, it cannot be withdrawn without extensive laceration. * * * * * should the fish be still alive, cut off the projecting or caudal portion, causing it to die of hæmorrhage * * * * the decay of the animal is most rapid;" and when it is complete, the extraction of course is easy; but on the whole I had rather some one else bit my perches for me.

The spines of an allied genus (*Polyacanthus*) "inflict a most severe burning pain which lasts for two or three hours" (Jerdon). I have not got it here; but it *should* be here. Another relative is the Gourami (*Osphromenus olfax*), which I believe has been put into Vehar lake. Whether any specimens have been taken out, I have not heard. It is a Chinese and Malay fish, naturalized in different places all round the world, and said to be very good eating, which reputation, and the family character of living with little water, or little change of the same water, have been the cause and means of its travels. I think it was Sir William Denison who introduced it into Madras, where it has since been chiefly looked after by Mr. Thomas.

Passing over one small family, the next worth noticing are the *Labridæ,* or Wrasses, which are represented in British seas. They are, with few exceptions small fish, haunting weedy rocks or coral reefs, exclusively marine, and remarkable for their bright colours, which vary in the individuals of several species, and in some appear to indicate sex, *a very rare case amongst fishes.* They could not be passed over, but I have not found any here that require special notice. None are of any importance as food, and our dull inshore waters, and barren basaltic reefs, are ill-suited to the development of their characteristic coloration.

The next family, *Chromides,* seems to be hardly represented here, if at all. One species, *Eutroplus Suratensis,* apparently received its specific name by mistake, the type specimen probably came from Tranquebar (Day). The genus is found in fresh-waters and estuaries on the Malabar Coast, and this species is said to take a bait freely, and be good eating; "but is not so easily captured in a net, as it buries itself in the mud, or dives under the net." It might be worth importing.

We have now disposed of the *Acanthopterygii,* or spiny-finned fishes, of which the Perch is at the head, and begin the *Anacanthini,* or soft-rayed fishes, whose file leader is the cod. The *Gadidæ,* or Cod family, are very numerous in northern seas, including such familiar fish as the Haddock and Whiting, the coarser Hake and Ling, and the sporting Pollack and Coal-fish, well known to marine fly-fishers at home. In Day's enormous list, however, there are only two species of this family recorded as Indian fish. Both are of one genus, *Bregmaceros.* I have myself obtained on this coast a single specimen of *B. Atripinnis.* Neither species gets beyond the size of a man's finger.

The next family, *Ophidiidæ,* is hardly more important; but the third claims a good deal of attention. It is that of *Pleuronectidæ* or flat-fishes proper.

I have already pointed out that the pomflet is *not* a flat-fish. As, he lies, even boiled, on a plate, one can see his blue back, white belly, and one eye only. Turn him over, and the other side is the same, from which any fisherman can learn at the hotel or club where he eats his first breakfast in Bombay, that the pomflet swims *on edge.* It is a general rule with marine creatures that the under colour is the lightest, and this is clearly a protective coloration, for any diver knows that white objects are easiest seen in the water below him, and dark things between him and the surface. The rule is not restricted to the sea, but extends to fresh water, though it is there open to far more numerous exceptions, and it affects not only fish, but nearly all sea fowl, many molluscs, aquatic reptiles (as the crocodiles, turtles, and some sea snakes), and to a very limited extent, the aquatic *mammalia.*

Now suppose a sole lying beside the pomflet. He shows only one dark colour on the whole visible surface, but he shows two eyes.

Turn him over, the whole surface now exposed is white, and no eyes are to be found at all. If he could speak, like the fish in the *Arabian Nights*, he could not tell us more plainly that he is a "flat-fish" belonging to the family now under consideration, and acknowledging the presidence of the Turbot.

The most curious thing about these flat-fishes is that their exceptional attitude and coloration, and their preposterous squint, are not congenital, but acquired habits.

The sole starts in life swimming upright, like the pomflet, and with one eye on each side of his head. But early in youth he acquires the habit of lying on one side, the necessities of his life (and probably the conditions of light) bleach that side, darken the upper one, the under eye gets slewed round, distorting the whole brow in the process, and with some curious progressive deformations of his tail, which need not be described here, he becomes a complete sole as we fry him.

The giant of this tribe is the Halibut of the North Pacific and Atlantic, who gets to the dimensions of a reasonable round table. He is followed in size, and much excelled in flavour, by the Turbot, after whom (in Europe) come the Brills and Flounders. All of these are very broad fish, and even the flounders, which are the least of the lot, come to 10 lbs. weight, perhaps more.

The Soles, though closely allied, are much inferior in all three dimensions, especially in "beam." All are marine, though a few pass above tidemarks.

The first division is not very strongly represented in tropical seas. On this coast its chief member is *Psettodeserumei*, which, for want of a better name, I may call the Indian Flounder. It grows to be 15 or 16 inches long, and is of the same flavour as the soles (the northern broad flat-fish differ very much from soles in this respect). It always comes to table, indeed, as a "sole," but flounders do that in other countries without its claim to that honour.

The Maratha name is "bákar," that is, "a cake of unleavened bread," and no doubt some of my readers know that an allied fish is known in Scotland as a "bannock-fluke." (*Vide* the Antiquary's famous deal with Mrs. Mucklebackit.) The tropical soles are numerous, and of various habit. Some species haunt rocks and coral reefs, and others sand and mud; the former are often handsomely marked. The sand, however, is the typical ground of the whole tribe, and hence it happens that soles are far less plentiful on the

Konkan Coast than on that of the flat desert regions to the northward.

The flat-fishes close the list of spineless fishes for this coast, and in the next order we shall find plenty of prickles, though they do not extend through the whole fin, as in the Perch and its followers.*

This is the order of *Physostomi,* and the first family, the *Siluridæ* or cat-fishes, is one of the most important in India. The fresh water cat-fishes are much the same in the Konkan as above Ghât, very numerous in individuals, and growing to a considerable size, considering the confined waters that they inhabit. *Wallago attu* attains here to about 3 feet in length.

The marine cat-fishes are few in species, but one of the genera, *Arius,* swarms in the estuaries and on muddy bottoms at 5 or 6 fathoms. It is essentially a bottom feeding fish, and does not, I think, go far out to sea. This fish has the extraordinary habit of carrying its eggs in its mouth until hatched. It has an armour-plated head and three spines, being the first rays of the dorsal and pectoral fins. The fry, when hatched, crowd up the estuaries with the tide and do a good deal of submarine scavenging; besides furnishing great sport to the little boys; who catch them by dozens with the simplest tackle. The *Arii* reach eight or ten pounds weight at least, and are said to be good eating. I have not tried them. The Maratha name is "Shingáda" or "Horny fish."

Less common than the *Arii* are two species of *Plotosus,* called in Maratha "Kálan." They are hideous brutes, with pretty much the body of an eel, a round head and a bunch of short thick feelers round the mouth. They have the same dorsal and pectoral spines as the *arii,* and the wound of these is so much dreaded by the half-naked fishermen that the hauling aboard of a "Kalan" is followed by a general scramble out of his reach. It appears to me that the fish quite understands his weapons, and writhes his body in a jerking fashion so as to strike with the erected pectoral spines. I have often seen one drive the spine deep into other fish lying beside him in the bottom of a boat. It is possible that he may use similar fence in killing fish too large for his comparatively feeble jaws; but this is matter of speculation only. Contrary to the habits of the *arius* and of the fresh water siluroids generally, the "Kalan" is a fish of the reefs; and has the clear brown and mottled coloration often characteristic of rock fishes.

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* *Note.*—Strictly speaking, classification by fin-prickles refers to the *paired* fins which in fish represent the limbs of other Vertebrates. But the vertical fins are also, important; and what is more, they are only apparently single, being formed by the coalescence of double lateral elements.

In a former paper I mentioned the adipose fin of some Siluroids as characteristic, in the Indian fresh waters. In the sea, however, they are not alone in possessing it. The *Scopelidæ*, or Bombay Duck family, all have it, and have even been classed as trouts on the strength of it.

The most distinguished of the family is certainly the "Bombay Duck" himself (*Harpodon nepereus*), in Maratha "Bhombil." "Bummalo" is either low Portuguese, or mere "Bombay bât," and not a pure native word at all.

Everybody in Bombay has seen the "Duck" at table, dried or fried, but hardly any European has seen him in his habit as he swims. The scales are fine, and very loose, and they are always rubbed off in the boat long before the fish come ashore, which is an extra merit in a table-fish as no fish-scales are wholesome, and many extremely irritating to the coats of the stomach. I must admit, however, that the naked, flabby-looking fish is not appetizing to look on, and it is best to defer inspection till he has got a new suit of bread-crumbs.

The great commercial merits of the Duck are that his gelatinous flesh dries quickly and safely in the sun, a great matter in a country where the price of salt is artificially multiplied, and that his relatively enormous and powerful jaws, armed with numerous and formidable teeth, can be easily and quickly hitched into those of a brother on the other side of the drying line, to the great saving of labour when many thousand fish have to be hung up. When dried, the Bhombil is not merely a trifle to eat with curry; he is the principal animal food of thousands of the poor, who cannot afford the frequent luxury of *salt* fish; and as for meat, don't taste it twice in the year. Every here and there in the Konkan there are temporary fish markets in the fine weather, to which people from the interior bring grain to barter for bundles of dried "ducks" and "scabbard-fish," to be carried up the foot-paths of the Ghâts upon their heads. Besides this, there is a great inward trade by more civilized methods of conveyance.

On one occasion I saw a goat make a raid on the unguarded basket of an absent fish-fag, and eat three or four fresh "bhombils" before the return of the screaming owner drove her off. This, however, was in Uran; where the brute creation is clean demoralized insomuch that the cows there are said to steal mhowa spirit, and stagger drunk along the streets. There is a fish much like the "Bombay duck," but inferior as food, (*Saurida tumbil*), which is known in Maratha as the "Chor-Bhombil" ("Chor"=thief), just as we talk of a "horse-mackerel," a "dog-whelk" or a "bastard florican."

After the *Scopelidæ* come the *Salmonidæ;* and it can hardly be too often repeated that there are no indigenous salmon or trout in India; though the Lochleven trout (*Salmo Levenensis*) has been introduced into the Neilgherries, with very doubtful success.

The next family, the *Scombresocidæ,* or Gar fishes and Flying fishes are represented in both fresh and salt water.

These are fishes so long and narrow that some of them are known in the British seas as "Horned eels;" they have, however, nothing of the pliability of the true eels, and their anatomy is altogether different.

In the first genus, *Belone,* the body and both jaws are long and slender, and the latter well-toothed. *Belone cancila* is their representative in fresh water; and *B. strongylurus* the commonest of several marine species.

After them come several species of *Hemiramphi,* or half-beaked fish, in which the upper jaw is short, and the lower very long. All are known in Marathi as "*Tuli*" and all live upon the surface of the water, and furnish, with the scabbard-fishes, most of the diet of our sea-fowl and of the sea-snakes; themselves bound to the surface by necessities of respiration. The fresh water *Belone cancila* is sometimes taken with a fly. They are very fond of playing on the top of the water, and skipping over anything in their way, and often jump into boats. Severe injuries have often been inflicted, in this way, on naked fishermen, by the larger species, which exceed 3 feet in length, and one way of trapping them is to float a net between four sticks, so that if the garfish jump over any stick of the four he falls into the net. They are very fair eating, though a novice is sometimes startled at finding the bones of several species dark bottle-green, almost black.

They usually take a trailing bait well; but are very apt to cut the trace with their teeth.

The second division of this family consists of the well known oceanic flying-fish (*Exocæti*), known in Marathi as "Chiri" or "sparrow-fish." Unlike the garfishes, which often come close in shore, these affect the deepest water, but like the former, remain near the surface. All readers in Bombay must have seen them in the Arabian Sea. On the coast they are rare, and I get but few specimens, and seldom see them when sailing near Bombay.

One might almost say that at that point about the deep-sea soundings line where you begin to see sea-snakes, you stop seeing flying fish. The best way of observing them is to stand in the very eyes of a steamer, and watch those which fly right ahead, and therefore give the longest view. The general colour is blue above and white below, but several are barred (especially the young) or spotted, and the play of light on their wet scales and pinions is something wonderful. They are, like the rest of the family, very fair eating.

The next family, *Cyprinodontidæ,* is small, and of no account, but its successor, the family of *Cyprinidæ,* or Carps, is of very great importance here, including a great majority of the fresh-water fishes of the Konkan, both by tale of individuals and variety of species. Inland the Cat-fishes rival the Carps, but here we have but few deep and muddy fresh waters fit for cat-fishes, and so these are only locally common in fresh water.

For the purposes of this paper, we may divide the *Cyprinidæ* into three sub-families, the first of which is composed of the loaches. These and the Alpine carps (*Discognathi*), have been already disposed of, in dealing with the Konkan-ghát-máta.

The second (this present division is rather convenient than scientific) includes the "Rohos" (*Labeo*) which in appearance and habit, most approach the European carp, the type of the family; being all vegetable-feeders, with a preference for comparatively still waters. The typical Roho himself (*Labeo Rohita*) is not found here at all, and his place is taken by *Labeo Calbasu,* and (I think) *L. dussumieri.*

The former is described by Major Beavan as "dark in colour, generally blotchy, and very slimy," but I do not find that this applies to specimens taken from clear streams in the hot weather, which were bright and clean, with many of the scales about the deepest part of the side spotted scarlet. Dr. Day also notices this coloration; and it has to be noted that he had personal experience of this fish on the West Coast, which Beavan had not. All the *Cyprinidæ* are very liable to local variation in colour, and sometimes even in shape.

The Barbels, so far as they have a choice, prefer comparatively rapid waters, and are in this country mostly omnivorous. The typical Mahseer (*Barbus tor*) is not, to the best of my knowledge, found here, but is represented by a fish I have doubtfully identified as the gold-finned Barbel (*B. pinnauratus*), which grows to about 10 lbs. weight, perhaps more, and as a sporting fish, is quite equal to any Mahseer, weight for weight. Here, as elsewhere, the live-bait is the most killing fashion of angling for barbel, and I have had no success with spinning-baits, and have not tried the fly in the Konkan. I do not think it would be found effective for the larger fish, but probably a good many of the smaller Cyprinoids, as *Rasbora danicornius* and the *Chelas*, and the fresh water Gar-fish mentioned on a former page could be taken with a light trout rod and midge flies, especially if bright coloured.

But the fresh water angling of the Konkan is, on the whole, poor. The lowlands are nearly all under rice, and in the rains every rice-field is a fish-trap, and every stream studded with weirs. The fish that go up to spawn seldom return alive, and the fry are taken in thousands, and serve to eke out the scanty meals of the labourers. Within my own memory, the few waters where tolerable angling could be had have greatly fallen off, and the stock seems to be only kept up by the inhabitants of a few more or less sacred pools and tanks.

Some of these are well stocked. In one, particularly, I have seen hundreds of sacred barbel come together to be fed. All were, apparently, of one species; and similarly another sanctuary seemed to be mostly inhabited by cat-fishes, which must have lived chiefly on each other, had it not been for the offerings of good Hindus. As it is, I suspect that they supplemented their charitable allowance by cannibalism.

The natives believe that even the otter and osprey respect these pools, and that the only European who had so little sense and good taste as to fish them, not only failed, but died of fever. I must say that he deserved the failure, but the fever was more than one could wish him.

The *Cyprinidæ* proper are exclusively fresh water fish, but some naturalists class with them the Herrings, Sprats, and Shads (*Clupeidæ*), which come next in our classification. These are mostly sea-fishes; a few live exclusively in fresh water, and most of these will take a a midge fly, but as they like deep and still waters (though living chiefly on the surface) these fresh water herrings are not very common in the Konkan. The *Chelas,* a genus of true *Cyprinidæ* which show considerable external resemblance to this family, take their place.

The Shads are anadromous, *i.e.,* run up rivers to spawn, but the Konkan streams are not big enough for them, and, besides, are very often barred by weirs. We do not therefore often get the Shads here " fresh-run," that is, in that stage of gravidity in which they seek the fresh water to spawn, which is with them, as with the European salmon and sea-trout, the best condition for the table. It is probably for this reason that the " Palla" (*Clupea ilisha,* the " Hilsa-fish" and " Sable-fish" of other parts), is not very common here, and but little esteemed. Another thing against it is that, like all the family, it dies and decays quickly. Now the Bombay fish supply is so organized that only fish which keep very well indeed (as the pomflet) have any chance of getting to table while still fit to eat. I have, however, occasionally got very tolerable " Palla-fish" even in Bombay itself, and more often down the Coast.

Some philosophers have maintained that this fish has given its name to the " Apollo " pier in Bombay, but there is this against the derivation, that native fishermen do not call the place " Palla Bandar " but " Pálú Bandar," and don't connect the name with this or any other fish.

The allied marine species are very numerous.

One worth noticing is the " Milk-fish or " Kedi" (*Chanos salmoneus*), much esteemed further south under the name of " White mullet." It has been successfully acclimatized in fresh water tanks, and is a handsome fish, of good quality when fresh, running to 3 feet long.

We have two pretty common " sprats" or sardines, the oil sardine (*Clupea longiceps*) and the rat-tailed sardines or " Mandils" (genus *Coilia,* several species). These come in great shoals in the cold weather, and are extremely good eating when fresh, like their European cousins.

The way to get them and the mackerel is to have a net hauled on the beach near one's quarters just before breakfast-time. If the fish are in-shore at all at the time, the net is pretty sure to take enough for a meal, and the fishermen are content with a few annas.

The two next families are small, and classed by some with the herrings. The first " *Chirocentridæ,*" contains one Indian sea-fish, the "Karli" (*Chirocentrus dorab*), which may be described as a sort of solitary and predatory herring. It is very long-shaped, with a sort of bull-head, and formidable teeth, which it uses very freely. The second, the *Notopteridæ*, has only two fishes, the queer "wambhs," (*Notopterus kapirat* and *N. chitala*), both fresh-water forms, mentioned before as known in Deccan waters. They are fair eating, and bite freely at a worm or bit of meat, but show no fight. In Upper India they are said to have an unholy taste for human flesh, but as we don't in these parts ground-bait our sacred streams with roasted humanity, we need not mind such a trifle here.

The next family, that of the *Symbranchidæ*, is not, I think, represented in our waters. It has few members, queer eel-shaped fish mostly capable of breathing air. At least one species, *Amphipnous cuchia*, can remain torpid in mud for a long period.

We now come to the true eels, or *Murænidæ*. I have only got one species of fresh-water eel in the Konkan, *Anguilla bengalensis*, which very much resembles the English eel, but has rather more variety of colour, mottlings and shadings of olive brown along the sides. It reaches about 5 lbs. weight, perhaps more. It is usually caught by the natives on trimmers, and is very fair eating, but is not common.

The sea-eels are very numerous in species and individuals.

The commonest are the "Isars" (*Muræna*), of which one species, (*M. tesselata*), is very beautifully reticulate. They haunt reefs, and are often taken with the hook and line. The same remarks apply to the genus *Uroconger*, of which we have but one species, the "Mulan" (*U. lepturus*).

The *Murænesoces*, or Eel-pikes, are fishes of deeper water and muddy bottoms, but often swim near the surface. They are remarkable for their large size and formidable dentition. *Murænesox telabon*, the "Waw," or "fathom-fish," is said to reach 10 ft. long, and its jaws are fully one-eighth of the total length, and studded with long and sharp fangs. Besides the jaw-teeth, most of these sea-eels have a central row of still more powerful fangs on the palate, and their bite is much dreaded by fishermen.

We have in our Museum specimens of several species, and of the spawn. They are nearly all fairly good second-rate fish for the table.

Here we come to the end of the order of *Physostomi*, and begin with the *Lophobranchii*, or armour-clad fishes, most of which are more or less encased in bony plates. The most noticeable are the *Syngnathi,* or "pipe-fishes," with two long jaws combined into a tube, and *Hippocampi,* or sea-horses, so called because their head and neck form a curious caricature of a conventional horse-head. They are mostly marine, small, and not very common, but as the most part of them consists of the bony armour, with a very small lining of flesh, they are easily dried, and make good specimens in that condition, being fixed, while fresh, with wires, in any attitude that pleases the artist. They have generally some arrangement for carrying their eggs about with them till hatched, and it seems that this duty is discharged by both sexes. We have several specimens of both *Hippocampus* and *Syngnathus* in our Museum.

The next order is that of the *Plectognathi,* and the first family in it are the *Sclerodermi,* beginning with the genus *Triacanthus.* The *Triacanthi* are awkward ugly fishes, with a profile suggesting that of an old horse, whence the Maratha name "ghora." They have one very strong dorsal spine, and two pectoral, a file-like skin, and unwholesome flesh. They are not uncommon here.

The next genus, *Balistes,* is not so ugly in form, being somewhat like the typical perches in shape, but deeper and blunter. The skin is still raspy, the flesh unwholesome, the dorsal fin has a strong but blunt spine, and ventrals are reduced to a mere bony excrescence, of no obvious use.

A third genus, *Monacanthus,* rather resembles *Triacanthus,* but has only one spine, dorsal of course. We have specimens of all three genera, the latter two are rather rare here.

This family contains also the extraordinary *Ostracions,* which are completely armour-plated, with a bluff upright forehead, and some have horns like a bull. I have got none here.

They are followed by a very curious family, the *Gymnodontes,* or naked-toothed fishes. In these, instead of the claw-like fangs of fishes in general, we have each jaw armed with a sort of bony beak, sometimes divided by sutures into two portions.

In the first fish which I shall notice, however, there are no such seams, each jaw is in one piece, whence the name *Diodon hystrix,* or the two-toothed Porcupine (sc. fish). The surname it owes to a complete set of horny spines $\frac{3}{4}$ of an inch long, covering the whole body. I have got here two specimens, one alive. It seemed to have little power of erecting the spines, but was very difficult to handle all the same.

It is a short, puffy-looking brute, with some power of blowing itself out into a balloon shape, but it is (to judge from my living fish) by no means a match in this art for some of its neighbours, to be presently noticed.

After *Diodon* comes *Triodon,* with two "teeth" in the upper jaw, and one in the lower. I have not got any specimens here.

The next genus is *Xenopterus,* which we have not got, but which I cannot refrain from noticing, for the benefit of members ordered to Burma. It is a yarn of the Burmese that these little fishes, when they see a man or any other large animal in the water, fall upon him in shoals, and bite little bits out of him till there is none left. Retaliation in kind is impossible or nearly so, as the whole family of Gymnodonts are bad eating, in degrees which range from mere nastiness up to sheer poisonousness.

After this amiable creature come the *Tetrodons,* or Parrot-fishes, with two so-called "teeth" in each jaw, very abundant here, and known to Marathas as "Ken." They do a lot of harm to tackle by biting through it, and when caught are useless, but lie open to retaliation of a sort, as they survive for some time out of water, and are always on landing "handed over to the tormentors," namely, gamins of the port. Now it is a character of the parrot-fishes that when irritated they puff themselves out like footballs and each small boy who has got hold of one forthwith proceeds to tickle the fish's stomach, a sufficiently ludicrous process to watch. When the parrot-fish, under this stimulus, has blown himself out as far as he can, the small boy lays him carefully down on the sand, and then, retiring a few paces, executes a hop-skip-and-a-jump, alighting with both heels close together on the unhappy *Tetrodon,* who of course goes off with a loud "pop," (like a grocer's paper-bag similarly treated), amid yells of delight from the "marine light infantry."

The parrot-fishes are the last of the *Teleostei,* or fishes with a complete bony skeleton. We now come to the cartilaginous or gristly sharks and rays, which, although usually of large size, are of very low organization, the proletariat of fishes. The "*Selachoid*" Sharks and Dog-fishes take precedence, "the best of a bad lot,"* They are usually to a great extent cylindrical, or rather cigarshaped, in form, though some are very flat-chested, showing an approach to the rays. *The gill opening are on the upper surface,* and the upper vane of the tail is the longest (heterocercal).

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* Certain philosophers have maintained that these brutes instead of being the canaille of fishes, ought to be classed at their head. All I can say to this is that I wish them a closer acquaintance with their clients.

There is no standing scientific distinction between Sharks and Dog-fishes. The latter is simply a term applied by fishermen to all small *Selachoid* fishes, and often to the young of the larger species, which, as with other fry, are very apt to swarm in-shore, perhaps partly with a view to keeping out of jaw-range of their elders. This is particularly the case on our coast.

Some naturalists translate "*Scylliidæ*" by "dog-fish," and the name was undoubtedly originally connected with the sea-hounds of the mythical Scylla. But the *Scylliidæ* as now restricted are spineless, and the "piky Dog-fishes" (Spinax) of the North Atlantic, which are armed with a very formidable dorsal spine, have too strong a hold on their name to be deprived of it by any classifier. The term "dog-fish," therefore, cannot now be used as the equivalent of any Latin scientific name, and must continue to be a popular term for small sharks in general. In this country, perhaps, we had better get on without it.

Our leading sharks are the *Carchariidæ,* one of which, *Carcharias gangeticus,* is said to be much dreaded at Calcutta, under the name of "ground shark," which is not in itself of much use. All the large predatory sharks swim high or low according to the position of their food, and the only species which habitually keep to the bottom are the harmless kinds that prey mostly on shell fish and crabs.

No sharks are considered dangerous on this coast. The large ones generally keep well off shore, in from 7 to 12 fathoms of water, and the fishermen do not care two-pence about them, except to cut their fins off, and sell them for export to China. I cannot help suspecting that there must be local causes for the reported ferocity of the Calcutta sharks. Possibly the throwing of dead bodies into the rivers may have something to say to it.

One of our sharks, *Carcharias tricuspidatus,* is said to reach twenty feet long further north. I have not myself seen any here of half that length.

The genus *Lamna* is closely allied to *Carcharias* (if really separate at all), but has only one species here, though represented in the Atlantic by the famous "White Shark," and many others.

Another genus, "*Galeocerdo,*" contains the "tiger-sharks," so called from their markings and bad temper; they are said to be much dreaded down the coast, and to one species is attributed the curious practice of laying itself out for dead, to tempt smaller fishes, which come to dine, and find the tables turned on them. I have not got any specimens here.

Next come the "hammer heads" and "shovel-heads," both of the genus *Zygæna,* most hideous brutes, named according to their respective deformities. A monster-gooseberry paragraph went round the Indian papers lately, about some huge "shovel-headed sharks," spotted like the pard, and capable of taking their prey without turning over, seen in the Red Sea. Curiously enough some one went to the trouble of suggesting "*Stegostoma tigrinum,*" which is indeed striped (no shovel-headed shark is) but is a ground-shark, or rather dog-fish, and seldom exceeds 5 feet long.

All sharks, and the shovel-heads as much as any others, must either *get over* their prey, or turn on their backs to seize it from below, and they prefer the former manœuvre themselves, but as they are usually observed at the surface, the latter is best known to the public.

The *Zygœnas* are credited with great ferocity, chiefly, I suspect, from their ill looks. As a matter of fact the conformation of their head, jaws, and breast, is against this, and indicates an approach to the rays, and a life at the bottom, supported on prey of comparatively small size. They have nothing like the gape of *Carcharias.*

The *Scyllidæ* proper are small and comparatively sluggish and harmless *Selachoids,* feeding mostly at the bottom upon carrion, molluscs and crustacea, spineless, and usually spotted or striped. Some have two barbels. We have several species, the most noticeable here is the *Stegostoma tigrinum* above referred to, a curious and quite harmless creature, which could not bite a man, unless he put his finger in its mouth. We have two specimens in our Museum.

We have none of the spined Dog-fishes in our seas. They are a very plague to the fisheries of the British Isles, and are also notable as being ovo-viviparous. I do not know whether any Indian shark has this character. Their place is taken here, as hinted above, by the fry of the large *Carchariidæ.*

The second sub-order of the Cartilaginous fishes is that of the *Batoidei,* or saw-fishes, skates, and rays. They are all more or less flat-chested; and some of them even broader than they are long (omitting the tail). They all have their gill openings below, and live as a rule, mostly at the bottom, though sometimes they come to the surface, and " squatter" along it in a curious way, or even leap high out of the water, apparently for their own diversion. The mouth is usually small, and except in the upper jaw of the saw-fish the teeth are small, blunt, and close set, often forming a sort of pavement. The jaws of most of them are very powerful, and between these they crush and grind the shell-fish and crustacea which are, in most cases, " the chief of their diet."

The first family among them is that of *Pristidœ,* or Saw fishes, called by the Marathas " Sonála," and by Europeans often (incorrectly, of course,) " Sword-fishes." In these the snout and upper jaw are prolonged into a flat round-ended beak, about one-fourth of the whole length of the fish, which sometimes exceeds 20 feet. Both sides of this are set, rake-fashion, with long flattened horny fangs, and the fish is said to use this formidable weapon by swimming rapidly past the victim, so as to deliver a sawing cut with all the teeth on one side in succession, or by writhing so as to strike side-ways with the points of so many teeth as may bear upon the object at once, inflicting a series of punctured wounds, and perhaps retaining the victim (if small) impaled upon the teeth. The former manner of fence is said to be used upon large fish, porpoises, and even men, and the latter upon small fish. The fishermen of the coast hold these saw-fishes in great fear (though they make no account of sharks).

The general shape of the saw-fish is not unlike that of a shark, but he is clumsier and flatter. The fins, which are very large and powerful, are exported as " shark-fins." Several species ascend rivers, and in sandy streams go far above tide-marks, but they have no great chance of doing this in the Konkan.

After them comes the curious family of the *Rhinobatidœ,* which have something the figure of the saw-fish, but broader, and in most species of their two genera (*Rhynchobatus* and *Rhinobatus*), the snout is prolonged into a sort of triangular shovel. This, however, is above the jaw, and is unarmed, the mouth is that of a true skate, with a pair of rasps for jaw. The fish of this type are known to the Marathas as " Lánjá." One species at least (*Rhynchobatus djeddensis*) is very common on our coast, and grows to at least 6 feet long. The only round-snouted species, which is called " Mivil" (*R. ancylostomus*) is exceedingly rare. I have only once seen it. It exceeds six feet. The Rhinobati are said to be rather larger, but they are all timid creatures, and the principal evil reported of them is a taste for pearl oysters. Their flesh is said by Dr. Day to be "considered nourishing," but is not much thought of here; the large liver is used to make oil of, and the fins pass for shark-fins in the trade.

After them comes the wonderful little family of the *Torpedos*, or electric rays. These have very much the outlines of a somewhat flattened tadpole, and nothing could suggest electricity less than their appearance. But they can give a shock sufficient to make a man sing out.

We have but two species, *Astrape dipterygia*, which is brown and white, and has one dorsal fin, and *Narcine timlei*, with two dorsals, and a sort of dull tortoise-shell coloration. We have both in our Museum, and I have had living specimens of both. They appear to live on the edges of reefs, feeding on small crustacea and molluscs, and I do not think that they can have much use for their curious power in foraging. It may, of course, protect them to some extent against larger fish. Neither species gets beyond eighteen inches long. I doubt if *Astrape* ever exceeds a foot.

The native fishermen call both species "Gingina," which is their name for any tingling sensation, such as that caused by a blow on the nerve of the elbow, or, as we say, the "funny-bone." The name may therefore be translated "tingling-fish." They use the creatures, characteristically enough, in a time-honoured practical joke, concealing them amongst other fish in a bucket, which is then handed over to one of the boys who are always marauding about the ports. The small boy is sure to stick his hand among the fish, and as sure to drop the bucket with a yell, amid the roars of his neighbours. Then all the little boys get together, and try to take the torpedo out of the bucket, just as you may see boys at home, who have got a toy electric machine, doing with a sixpence in a basin of water. The fish soon exhausts his battery, and can then be handled with impunity.

After these torpedos come the *Raiidæ*, or rays proper, represented in India by one fish, *Platyrhina schonleini*, which I have not found here; and then an important family, the *Trygonidæ*, or sting-rays, called in Maratha "Phákate." These are all lozenge-shaped creatures, generally broader than long, bar the tail, which is long and whip-like, and often armed with one, two, or three caudal spines long, sharp, and barbed all down both sides like some sort of a cannibal harpoon. The natives say that they wind the tail round their victims and then stab them to death with this case of daggers, which always reminds me of an Arab or Makráni swash-buckler with three jambiyas in one sheath. So far as I can observe, however, the tail is not really in any way prehensile, and takes no more hold than a very supple cane or whip would. It is apparently very liable to accident, a perfect tail is as scarce amongst veteran rays as amongst Bombay "Biles" at the end of the season. But I did get one fine specimen of the typical species (*Trygon Uarnak*), in which it seemed perfect, and the measurements were as follows:—maximum diameter 6 feet, length without tail 5½ feet, tail 8½ feet. The tail spine had been broken off and lost, the stump was one inch across, and from a number of measurements of other spines I find that their length is to diameter in a proportion that varies from × 7 to × 10. This spine, therefore, cannot have been less than 6 inches long, and may have been 10. I could hardly blame the fishermen for breaking it off before getting the monster aboard. They dread these rays almost as much as the saw-fishes.

Dr. Day allows this species a tail three or four times its own length, so my friend might have had a tail 22 feet long, but the longest of which I have good record on this coast is one mentioned in the "Tanna Gazetteer" as of 13½ feet. Several other Trygons, and the allied genera *Tœnicura* and *Pteroplatea*, are as big, and as well armed. They live mostly on muddy bottoms, hunting crustacea and molluscs but at times, as noted above, rise and play and leap on the surface.

In the next family, *Myliobatidœ*, this habit is still more common, and some have spines on the tail, but in the first genus, *Myliobatis*, they are not universal. It is represented on this coast, I think, by the "Hanwatia" or "monkey-skate," a small unarmed fish frequenting the edges of reefs, and handsomely spotted, probably *Myliobates maculata*.

The rest of this family are more or less hideous and monstrous, but the palm belongs to the Bat-ray, or Devil-fish (*Dicerobati eregoodoo*), called in Maratha "Piwri." This monster is twice as broad as he is long, reaching 18 feet across the wings and 9 from the snout to the root of the tail, which is 1½ times the length of the body, if not shortened by accident. On his head he has two projections somewhat of the shape of hare's ears, directed forwards. He appears usually to swim high, and I have seen one jump a good six feet out of the water. The only good thing to be said about him is that he has no spine in his tail.

These big skates are no doubt amongst the wonders of the sea, and make one think of the "Kraken." But the best story of one that I know is in a book called "Blue Water," the author whereof maintains that he saw at sea a skate which he took to be *seventy feet* across the wings, "Noo," as the Scotchman said, "we'll see what can be dune aboot the breadth of the skate." In the first instance, the writer, a Mr. Keane, was at one time known in Bombay as the author of a very quiet and "verisimilous" narrative of a pilgrimage to Mecca, contributed to a daily paper here. Secondly, in the same book, he deals with other fishes in a style free from exaggeration or romance, and indeed his remarks upon sharks are very valuable, on account of the care taken to strip the subject of its usual envelope of tall talk. Finally, his description of the big skate's proceedings is clearly taken from observation of a big skate on the top of the water, the opportunity for which, and the power of using it, are not very often found. The monstrous dimensions that I have assigned to the Bat-Ray are taken from Sir Walter Elliot's measurement, and are well known to be equalled by some American *Batoidei.*

It appears to me that, making every allowance for the fact that Mr. Keane's Kraken did not stop to be measured, he may fairly be credited with a breadth of 40 feet, and if his proportions were those of Dicerobatis (which is about the shortest tailed of the family), his tail may have been 30 feet of a total length of 50, allowing for its curtailment by accidents in his necessarily long life.

Such an animal, swimming and playing near the surface, would account for any amount of sea-serpent stories, and especially for those in which the serpent attacks a whale, represented by the body of the fish. There is nothing in the nature of things to prevent the large Batoid fishes from ranging from 4 feet long to 50, any more than in the case of the cetacean mammals, which do so on this very coast. I have shown cause above for believing that the sea-serpent, whatever he is, belongs to no known type of marine Ophidia.

As my penultimate fish is the biggest on record, my very last shall be one of the smallest, if indeed it be a fish at all. In the water, it is simply a black dot with a silvery rim or edge. But on removal, this is seen to be the eye of a purely transparent gelatinous creature having the shape of a very narrow sole, but swimming upright, quite symmetrical, and about 3 inches long (in the largest specimens). On immersion in spirit it assumes a dead semi-opaque white colour, and seems to show some trace of a vertebral system. Several specimens are in our collection.*

ON BOTS (LARVAL ŒSTRIDÆ) OF THE HORSE AND CAMEL.

By Veterinary Surgeon J. H. Steel, A.V.D.,
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I wish, in the following short paper, to contrast the external conformation of *Pharyngobalus cameli* with that of *Gastrophilus equi*; in other words, the larval gadfly of the camel with the less maggot-like larva of the common horse gadfly.

I trust from this slight study to deduce results of no small interest and general importance, as well as to indicate some points on which I have not been able to assure myself, and concerning which perhaps other workers may be able to enlighten me either at once or as the result of investigation.

These bots are maggots which live in the alimentary canal. They differ much in appearance from each other and from ordinary maggots, and in the details of structure they are, respectively, excellently adapted to the situations they occupy.

Practical observers have long noted "maggots" coming from the nose of the camel, a little different from ordinary maggots. But the noses of camels, especially, are liable to lacerated wounds, from the nose peg and other causes, which in a tropical climate and on active service are sought out by the common fly and soon become the seat of development of common maggots innumerable

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* Angling in the Konkan is so very poor a business that no one need go out of his way for it. But a fair evening's sport can sometimes be had with a fly-rod of 12 to 15 feet and fine tackle, a light small float, and a small hook on strong gut. The best bait is made of the dwarf or fry barbels, cut short behind to not more than an inch long; and hooked through below the spine; under the shoulder. The method of fishing is as with live-bait. There should be a grain or two of shot on the trace, and the bait should be about half way to the bottom. A landing net is desirable. A private correspondent referring to my remarks on the Barbels of the Deccan (Vol. 1 p. 100), says that the typical European Barbel, though usually found in comparatively still waters in England, does on the Continent of Europe (and specially on the Upper Rhine) frequent rapids like our mahseers. Also that the allied fish referred to by me as called "shell-fish" in German must be this species, "Burbot" and "Burbolt," being both names of the English "eel-pout," a fish of another family altogether. Further that this name (the German equivalent of "shell-fish," whatever it may be) is assigned in German dictionaries to *salt-cod*.

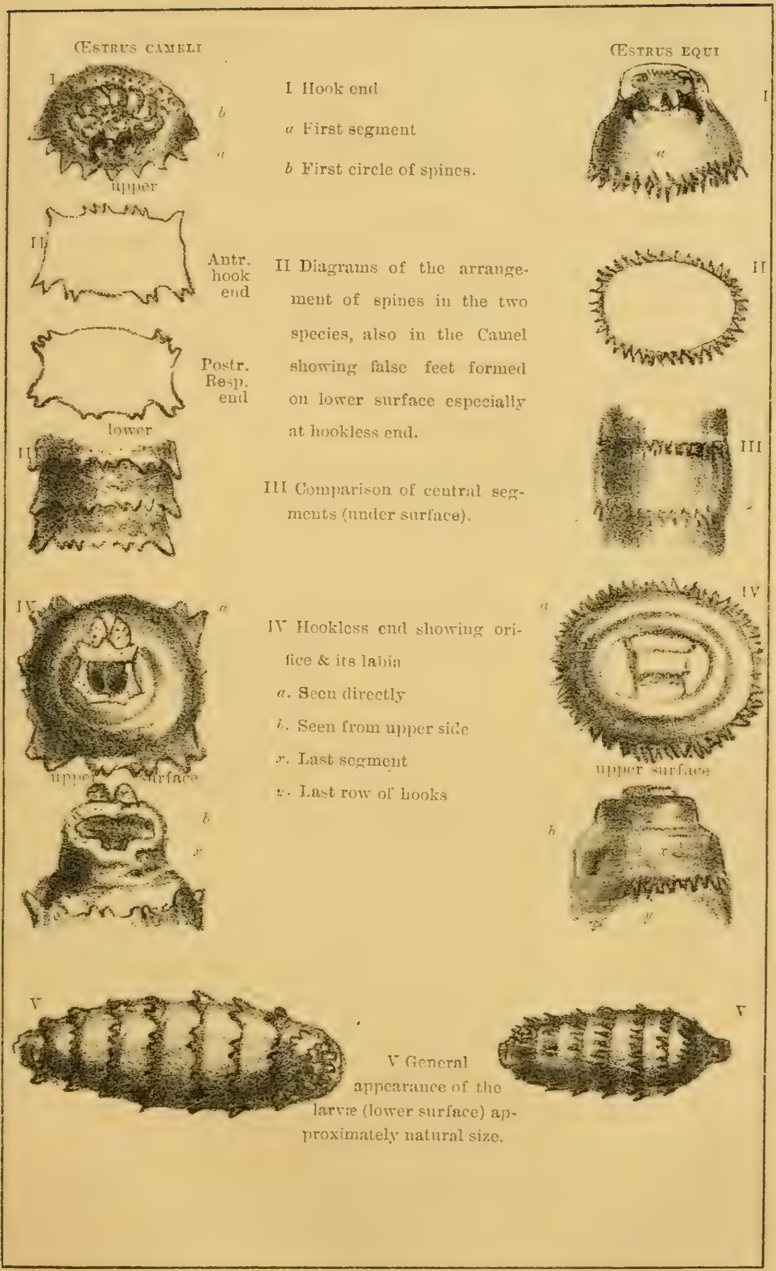
A correspondent in Bombay has promised to add to my list of Konkan water-fowl; and I shall be very glad if any one else will do so too. The notes of any single observer must necessarily leave much room for such addenda.

Inspecting Veterinary Surgeon Burt in his recent Report on the operations along the Nile, says that maggots in the nostrils caused great inconvenience, an offensive discharge tinged with blood, and a continual shaking of the head, the camels being dull, off-feed, and the maggots larger than those in wounds and "more resembling a grub." I. V. S. Oliphant records their frequent occurrence in Afghanistan during the 1878-79 Campaign and V. S. (1st Cl.) Rayment noted their frequence in the Soudan. V. S. Fenton brought me some specimens when he returned from Suakim this year with the Madras Troops, from these specimens I derive the following conclusions:—

The camel bot is half as big again as that of the horse, is much softer and more tapering towards the hookless extremity, whereas it is blunter and much more compressed towards the hooked end while the section of the horse bot is evenly oval, that of the camel bot is flattened on the lower surface. In both the body-ring *bearing spines* are nine in number and the spines point from the hook end. The following contrasted list of characters may best be given in the tabulated form :—

HORSE BOT.	CAMEL BOT.
Spines—Small, hard, sharp, very numerous on each ring and largest on the central rings. Small extra spines alternate with the main ones and are situated behind and in the intervals between them, forming as it were, two rows in each circle. The bulging parts between the rings are smooth.	*Spines*.—Fleshy and in single row, very large, teat-like, and blunt. The largest are in the central rings but not markedly so. The main spines vary in size and tend to collect into groups with spaces between them. Those on the lateral parts of the lower surface tend to develope into temporary feet. On the most projecting parts of the segments between the rings of spines are small spinelets which below are very numerous and form continuous bands. In the different parts of the body the teat-like spines vary in relative position (*vide* diagram).
Hook-end.—Hooks brownish-black and sharply divergent, short and much curved, situated inferiorly near the extremity of a long narrow hook-end. A central organ of chitine is midway between the bases of the hooks, and there are a few spinelets above and on either side of two well marked	*Hook-end*.—Hooks black; diverge at an acute angle and are slender, long, and little curved, situated below the anterior extremity and beneath a 6-lobed mass surrounded above and on each side by irregular circlets of spinelets which communicate at each extremity with the first zone of

Bots of the Horse and Camel.


Œstrus cameli
Œstrus equi
I
b
a
upper
II
Antr. hook end
Postr. Resp. end
lower
III
IV
a
upper surface
b
x
V
I
a
II
III
IV
a
upper surface
b
x
y
V

I Hook end

a First segment

b First circle of spines.

II Diagrams of the arrangement of spines in the two species, also in the Camel showing false feet formed on lower surface especially at hookless end.

III Comparison of central segments (under surface).

IV Hookless end showing orifice & its labia

a. Seen directly

b. Seen from upper side

x. Last segment

y. Last row of hooks

V General appearance of the larvæ (lower surface) approximately natural size.

* These segments are a little too wide in the drawing, they should be closer.

sense organs (situated above the hooks). These sense organs are all but sessile. The first row of spines is complete.	hooklets above and below. This first zone is a very irregular one. There is no chitinous organ between the hooks. The pigmented sense organs are on long peduncles the bases of which are connected by a band. There is another transverse band below the hooks. The first row of spines is deficient inferiorly.
Hookless or orifice end.—Opening oblong. Its cavity black throughout. Its lips transversely bifid and the lower one much larger than the upper. The upper one continuous laterally with the side lobes. The last segments are arranged telescopically and bear no appreciable spinelets.	*Hookless or orifice end.*—Opening an almost circular cavity, black only in two lateral spots, upper lip semicircular and with four well marked angles, lower bifid, consisting of a tuberous part elongated transversely and also of two bifid protuberances each bearing a mammillary process. There are spinelets on the two latter and on the lower lip. The general aspect of the opening is upward. Last segment irregularly telescopic.

The characters amply prove that the camel bot serves as a connecting link between the peculiar tough horse bot and ordinary maggots, they show that the strange leathery spines of the horse bot are not chitinous or horny nails but true papillæ, they show that these papilæ tend to arrange themselves in groups and some develope into foot-like organs while the others lose their importance. By contrast of these organisms with common maggots we may infer what features of structure are necessary for a grub that lives in the stomach (as the horse bot does) and what for a resident in the pharynx (as the camel bot). The latter it will be noticed is softer and less irritant than the former and probably, as having rudimentary false legs, a much better traveller. He makes his exit from the body through the nose, whereas the stomach bot of the horse passes through the anus. The difference in position of the hooks is interesting; the camel parasite has them arranged like a pair of delicate anchors, which he can throw down when he wishes to obtain a grip sufficing to prevent his being swallowed with food, whereas the horse parasite has much stronger grappling hooks arranged like the horns of a stag beetle and suited to enable him to hold tight in whatever direction the churning motion of the stomach may drag him.

The posterior orifice-like cavity is considered a respiratory sac, but what the black material in it is I am not prepared to state. Why does the camel parasite have stalked eyes and the horse parasite stalkless ones? Why has the latter only the chitinous organ between the hooks? And why should the lips of the orifice of the camel parasite develope into artistically arranged lobes while those of the horse bot are severely devoid of ornaments? All these and many other problems suggest themselves in the study of these peculiar creatures.

The continuous irritation produced in the nostrils and pharynges of our poor camels exiled to the shores of the Red Sea, the probability that a certain amount of their now historic exhaustion depended on these bots, and the certainty that in future Campaigns where camel transport is used these parasites must be remembered and got rid of, give the *Œstrus Cameli* a considerable practical veterinary interest.

PARASITES IN THE WILD ASS OF CUTCH.

By V. S. John Henry Steel, A.V.D.

Superintendent, Bombay Veterinary College.

Through the kindness of Messrs. Sterndale and Phipson I was, in July of the present year, placed in possession of the carcase of a young wild ass from Cutch. The animal had been strangled in attempts to ship it for England. The skin was handed over to the Society for preservation, the hoofs and skeleton have been retained by me, and I examined the carcase carefully for parasites. This was all that could be done under the circumstances, our dissecting room being then not ready for use and our operations in *post-mortem* examination conducted under a downpour of rain, in the open. The investigation showed beautiful development of the muscles (and especially their tendinous portions) of the limbs, and the lesions of strangling were well marked. As concerns parasites I wished especially to make careful examination because I had recently opposed the popular view that these beings do not occur in wild animals to such a degree as in domesticated, and that in the latter they must be considered pathological rather than in their natural *habitat*. I thought if horses standing in the open have more parasites than those more carefully tended, surely animals in the jungle should still more be invaded by the various Entozoa. In the case under examination everything was against my being able to establish my theory; the animal was young, and old animals though they suffer least from parasitic invasion are more often the victims of it than young, the ass came from a part of the country wherein salt marsh is frequent and, as is well known, salt pastures are prejudicial to most forms of parasite.

The result, however, was as follows :—

A. *Stomach.*—Cysts, and spiroptera either from these cysts or of the species which inhabits the stomach cavity.
Bots.
Ascaris megalocephala.

B. *Small Intestine.—Ascaris megalocephala,* in enormous numbers, some seventy of these very large round worms being obtained from the stomach and small intestine.

C. *Cæcum and commencement portion of the Colon.*—Cysts with small white worms both in them and in the cavity of the bowel.
Strongylus armatus.

D. *Rectum.*—Oxyurides—a few.

E. *Anterior Mesenteric Artery.*—One immature *Strongylus armatus.*

Liver, lungs, and peritoneal cavity apparently free from invasion.

Thus five localities were infested, the parasites found being of at least six different species and some forms of them extremely numerous. The following points seems to me worthy of comment :—

(1.) The parasites above enumerated must be obtainable by animals out on natural pasturage. This is likely to be a useful hint as regards their prevention in domesticated equines: whether these species are obtainable in spite of saline pasturage or no it is impossible to say, but one feels inclined to consider such a view supported by the circumstances of the case; at any rate it is a point worth investigation in the future.

(2.) It is evident that parasitic invasion is not by any means an infliction on animals following solely in the train of domestication. It has been authoritatively stated that *Strongylus armatus* is never found in the wild ass, although it is of almost constant occurrence in old domesticated donkeys, my observations distinctly prove this to be an error, probably at some other season of the year the anterior mesenteric artery would have been found crammed with the immature worms, but the single specimen I found there amply suffices to establish my position.

(3.) The absence of the following common species of equine parasites should be noted :—*Fasciola hepatica, Strongylus micrurus, Filaria Papillosa,* Hydatids, and Amphistomes.

(4.) The numerical preponderance of Ascarides is interesting, for these parasites are, according to my observations, rather rare in domesticated equines in this country.

(5.) Cysts with small white worms in the large bowel are rare. They were very numerous and did not resemble the immature *Str. tetracanthus.* Indeed they rather reminded one of the Spiroptera found in the stomach. I have not made a detailed examination of the specimens, but if they be Spiroptera from the cœcum, this is remarkable, as also would be the absence of *Str. tetracanthus,* so frequent in domesticated equines.

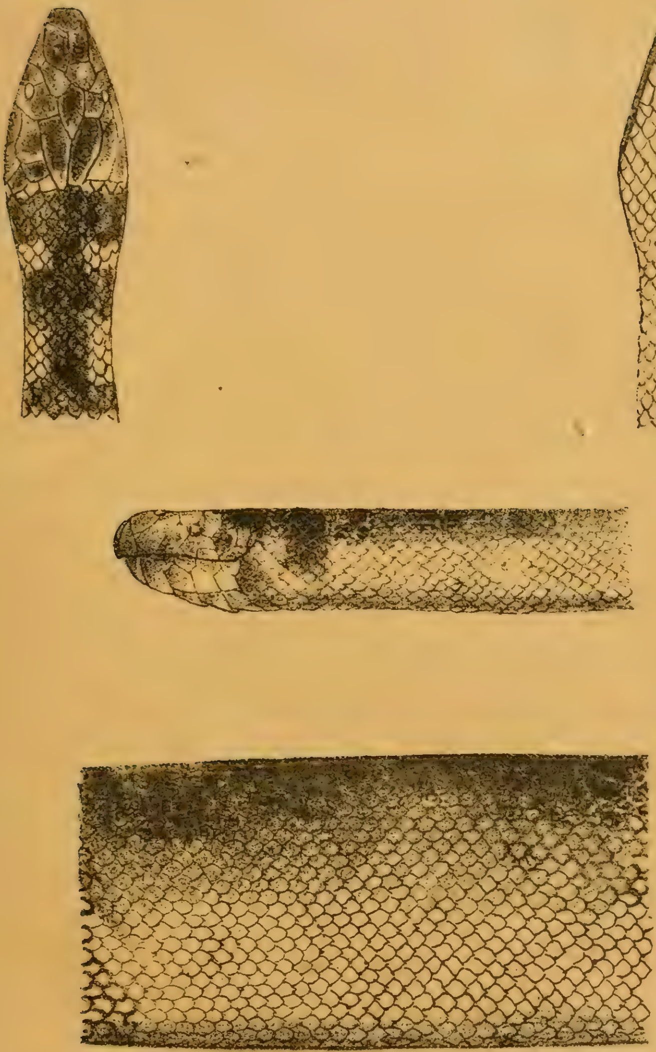
(6.) It is interesting to observe that the parasites which infest the wild ass are of the same species as those found in the domesticated horses.

DESCRIPTION OF THREE NEW SPECIES OF HYDROPHIS FROM THE BOMBAY HARBOUR AND THE MEKRAN COAST.

By James A. Murray.

Hydrophis Phipsoni. *Sp. Nov.*

Head scarcely distinct from neck; rostral pentagonal, as high as wide; length of nasal 1¼, its greatest width; vertical subtriangular in front, tapering behind, and fitting into a nearly triangular furcation between the occipitals; the length of each occipital is twice its greatest width. 3—4 temporals on the side of each occipital, the anterior the largest and separated from the 6th upper labial by an intervening shield. 7 upper labials, the 3rd, 4th, and 5th under the eye. 9 small and 2 large lower labials, the 1st on each side in contact behind the triangular mental, the 3rd, 4th, 5th, 6th, and 7th have three large shields below them. Two pairs of chin shields in contact with each other. One præ and one post-ocular, the latter in suture with the superciliary, occipital, anterior temporal, the intervening shield between the 5th and 6th upper labials and the upper edge of the 5th labial.



A.Descubes del & Litho. A.F.Cortez Litho: 86.

HYDROPHIS PHIPSONII. (*Murray.*)

Scales carinate mesially, the carina strong on the vertebral region and breaking up into tubercles posteriorly; laterally the scales are feebly carinate. Scales round the neck in 36—38 series; round the highest part of the body in 40—42 series. Ventrals entire, twice the size of the adjoining scales and bituberculate.

Colours.—Yellowish ochrey, with a wide black dorsal stripe, a faint one on each side of the body, and a fourth one along the whole extent of the ventrals—the lateral stripe gradually disappears with age. Head black, with a horse-shoe shaped yellow band from the frontals to behind and above the gape. Tail black.

Length.—30 inches, of which the tail is 2 inches.

Hab.—Bombay Seas.

I have much pleasure in associating with this species the name of our worthy and energetic Secretary, Mr. H. M. Phipson, in whose collection the first specimen of this interesting species was found.

HYDROPHIS GUTTATA. *Sp. nov.*

Head longer than broad, scarcely distinct from neck; body stout; 40 series of scales round the neck, 54 round the highest part of the body, and 17 on each side of the tail. Scales imbricate, keeled, each keel interrupted in the middle; posteriorly on many scales they are bituberculate. Rostral 5-sided, lobuliform below, with a deep notch on each side. Nasals higher than wide, in contact laterally with the 1st and two-thirds of the 2nd upper labial; frontals in suture on each side with the single præocular and posterior third of the second upper labial; vertical hexagonal, pointed behind and rather longer than its greatest breadth; each occipital as long as broad; a large scale between the furcation of the pair. Temporals three, the hindmost largest; the first longer than wide, obliquely placed and in contact with the post oculars and two large shields above the 7th, 8th, and 9th upper labials. Upper labials 9, the 4th and a subtriangular shield above the 5th and 6th labials enter the eye. One præ and two post-oculars. Superciliary one on each side, but mesially in its upper third and grooved below. *No chin shields*; 12 lower labials; two obliquely placed elongate shields twice as long as broad, below the 4th and 5th labials, and a quadrangular one between the 6th and 7th; 19 scales between the 1st lower labial and 1st ventral shield. Ventrals 265 in number, bifid, and arranged opposite to each other. They are scarcely as large as the adjoining scales. 3 enlarged anal shields; 43 series of scales along the lower edge of the tail to the terminal notch.

Length.—42 inches, of which the tail is 5 × 1½ inches.

Colours.—Yellow, becoming ochrey beyond the middle of the trunk. Head olive. Forepart of trunk with 10 ovate black spots on the vertebral region, separated by a single series of yellow scales; laterally these 10 interspaces are divided by a narrow brown line and a dark spot; beyond this the broad bands run down on the sides to about one-third the distance from the ventrals, the alternating dark spots of the forepart of the trunk cease, and begin on the ventrals instead, along which there are 33, of various forms and sizes, including the one on the anal region.

Tail completely encircled with 5 black bands; tip of the tail black.

Hab.—The Mekran Coast.

The present species evidently belongs to that group of Hydrophidæ classed by Dr. Gunther in his *Reptiles of British India*, as having small imbricate scales in 43 to 47 series round the neck, ventrals split into two. It, however, differs from the group in having large scales, and in the number of scales round the neck being 40 instead of 43—47, and from the only species showing these characters, viz. *Hydrophis Stokesi*, it differs in having the 4th labial and a detached shield under the eye and 33 large black blotches along the ventrals. The number of ventral shields is not given by Dr. Gunther, nor the number of black cross bands on the trunk and tail. The colouration partly agrees with the description of *H. Stokesi*, from the Northern Coasts of Australia, but the differences are sufficiently marked to separate it from any known described species.

It may be mentioned that although Dr. Gunther at the time of writing doubted the occurrence of *H. Stokesi* in the China Seas and in the East Indian Archipelago, Mr. W. T. Blanford in *P. Z. S.*, 1881, states that two specimens from Singapore examined by him must be identified with it.

HYDROPHIS PLUMBEA, *Sp. nov.*

Rostral 5-sided, triangular at apex and reaching the upper surface of the head. Nasal wider than high, in suture laterally with the first two upper labials. Frontal, as wide as high, rounded behind and in suture with the upper præocular and superciliary. Vertical hexagonal, subtriangular in front and tapering behind. Occipitals 5-sided, the length of each twice the greatest breadth. Temporals three on each side of each occipital, the anterior largest and nearly entering the labial margin. Upper labials 8, the 4th under the eye, the 6th and 7th small and about one-fourth the size of the 8th. 10 lower labials. 30 series of scales round the neck. Scales of the body keeled. Ventrals 230, the 1st separated from the posterior pair of chin shields by 4 scales only. First six ventrals wider than high, and four times as wide as the adjoining scales, the rest decreasing in size from three times the size of the adjoining scales till at four-fifths the length they are scarcely larger than the adjoining series.

Colours.—Plumbeous dorsally on the upper third, with faint dark brown cross bars, of which there are 32 on the trunk and 2 on the tail. Scales above and below the tail, and on the half of its terminal length black with some white scales intermixed on the latter. Sides and abdomen white, with faint indications of the dorsal bands running down on the sides. Upper and lower labials also the rostral, mental and chin shields of a salmon colour ; a faint dark streak in front of the eye, and a salmon-coloured spot on each side behind the gape.

Hab.—The Mekran Coast. Both this and the preceding (*H. guttata*) were collected by Capt. E. Bishop of the I. G. S. Patrick Stewart.

A LIST OF THE BUTTERFLIES OF THE BOMBAY PRESIDENCY IN THE SOCIETY'S COLLECTION.

WITH NOTES BY E. H. AITKEN.

(*Continued from page* 218, *Vol. I.*)

PAPILIONINÆ.

73. *Ornithoptera minos.*—Athough there is no specimen of this butterfly in the collection on which these notes are based, I will include it here, having known three instances of its occurrence in the region with which they deal. On the 5th of June 1873, I caught a fine female in Poona and on the same date six years after I saw one at Karanja. In the interval the Rev. Dr. Fairbank had taken one, also a female, in his garden at Ahmednugger. For an insect with such powers of sustained flight a journey of a few hundred miles, with the wind, must be a small matter, and I imagine these specimens drifted from the Canarese or Malabar Coast, among the beautiful backwaters of which the species is so abundant that a Collector in Calicut told me he slew every one that came within his reach, regarding them as a nuisance. I felt sorry for the victims, but more so for their murderer.

74. *Papilio agamemnon.*—This is very common both in Bombay and the Deccan and on the hills too, and to the young collector it has a peculiar fascination. It flies fast and with a good deal of style and is rarely seen to settle. When it does alight it selects a shady spot and rests with wings closed. Sometimes on a hot day it will spend a long time flitting up and down under a shady tree as if on sentry duty. The larva feeds on the custard apple and must be sought on very fresh leaves in the shade. It rests on the upper side of the leaf, like all papilio larvae. It is the most difficult of caterpillars to rear. It will remain on a faded leaf and starve sooner than move to a fresh one and cannot be transferred without injury as it carpets the leaf with silk and hooks its feet to it. I have never succeeded in rearing one from the egg.

75. *Papilio sarpedon.*—This, the most sprightly of all our butterflies, is found only on the hills; very common there about the end of the year. It is swift, restless, very hard to catch, and when caught generally breaks its wings in the net. It is very fond of sipping the moisture from damp ground.

76. *Papilio nomius.*—I have never seen this species alive. The specimens in the Society's collection were sent by Mr. Davidson and Mr. Wroughton from Khandesh and the Ghauts which lie between the Tanna and Nasik Districts. I am told it frequents ravines and flies very swiftly.

77. *P. erithonius.*—The commonest of the genus, occurring everywhere and appearing almost throughout the year. The larva feeds on various trees of the orange tribe, but in Bombay forsakes them all for the most offensively odoriferous garden rue.

78. *P. pammon.*—This is nearly as abundant as the last, the polyctor form of the female being decidedly the most common. There seems to be nothing seasonal in the appearance of the different forms. I have reared all three from eggs laid by polyctor, in the same week. The larva feeds, like that of the last, on various species of the orange tribe, refusing others. I have never found it on the pummalo, nor on the rue, of which the last species is so fond, but a sweet lime in my garden now can scarcely keep a fresh leaf, and a small Japanese orange is sadly ravaged. Another favourite is the curry-leaf—*Bergera koenigii*— on which I have never found the larva of the last species. The pupa is green when it forms in the midst of green leaves and brown when attached to the trunk of

tree. In neutral circumstances the colour seems to be optional! I have seen a green and a brown pupa on the same pane of glass.

79. *P. polymnestor.*—I do not understand the distribution of this butterfly. It is absolutely unknown in Bombay and I imagine throughout the Konkan, but becomes one of the most familiar objects as soon as we reach a level of 2,000 feet. I do not think it occurs in the Deccan generally, but in Poona it frequents the old gardens in the city. Again it abounds all along the Malabar Coast at the level of the sea. Its chief season appears to be the latter half of the monsoon, but a good many come out in March and some may be met with all through the hot months. The larva feeds on lime and orange.

80. *P. helenus.*—I found this not uncommon at Mahabaleshwar last March, but have never met with it elsewhere. I know it occurs occasionally at Khandalla. This and the last two species have the habit of going regularly round a certain circuit, so that by taking one's stand at a spot where it has passed once one is pretty sure to meet it again every half hour or so.

81. *P. dissimilis.*—This is either very rare in the Presidency or passes so easily for *Danais limniace* that it escapes notice, but last year in November and again in February I found a good many larvae on a tree near my house which proved to be *Tetranthera apetala,* rather an uncommon tree in Bombay. The larva grows to a very large size, but just before becoming a pupa it voids a transparent membrane, like a bladder filled with air, which reduces it considerably. One end of this is attached by a fine black cord to the surface on which the larva rests and the other merges in a large gathering of excrement. The pupa is a much more remarkable example of mimicry than the perfect insect. Its resemblance to a withered twig broken off short being perfect in every detail. Distant in his magnificent work quotes more than one authority to the effect that the flight of this butterfly is very strong. My observation does not confirm this. On the contrary I have been more than once struck with the degree to which its mimicry of *D. limniace* was supported by the similarity of its lazy flight and attitude.

82. *P. clytia.*—Among the larvae of the last species, which I reared, was one, not distinguishable from the rest, which to my astonishment turned into this. I am quite satisfied that the two are one species. I have never recognised another specimen of

panope in this Presidency, but have little doubt that I have often let it pass for *E. core*.

83. *P. diphilus.*—This species is not rare in Bombay, but has its home on the Deccan plains, where throughout the cold season one finds every babool tree, early in the morning, decorated with hundreds of them torpid with cold. They always rest with wings expanded. The larva feeds on *Aristolochia bracteata,* a common weed in black soil. The flight of this species, like that of most protected butterflies, is notably feeble.

84. *P. hector.*—I have found this in Poona, Bombay and the Islands of the Bombay harbour, but it is rather a scarce butterfly in this Presidency. It seems to be much commoner some years than others.

PIERINÆ.

85. *Hebomoia glaucippe.*—I have never seen this at Poona, nor in open country anywhere, but in hilly country it occurs down to the level of the sea. One specimen in the collection was caught on Malabar Hill in Bombay, and it is not uncommon across the harbour. On the Ghauts it is very abundant in March and perhaps throughout the cold season. It flies very fast, but often stops at a flower, resting, like the next four or five species, with its wings half open and drooping.

86. *Ixias mariamne.*—This occurs every where and at all seasons, frequenting hedges and small jungle. It is equally abundant on the hills and on the plains.

87. *I. pyrene.*—Perhaps not quite so plentiful as the last, but equally ubiquitous. I believe in only two species of *Ixias* in this Presidency. Those who describe under a new name every specimen in which their practised eyes detect some minute diversity in the position of a spot or the breath of a margin, seem to me to assume an invariability of specific coloration which has no parallel elsewhere in the animal kingdom, and the argument that the varieties so described are *constant* loses all force to the plain man's mind when he finds that one expert rejects half the species founded, or accepted, by another.

88. *Teracolus danaë.* This species seems to require a dry climate. I have found it pretty common in Berar and Cutch and it occurs in Poona, but not ordinarily in the Konkan, though Col. Swinhoe took it in Bombay during the famine year.

89. *T. etrida.* I have not yet seen any reason to believe that

all the orange-tipped *teracoli* in this Presidency constitute more than one species. It is subject, like most of the *pierinæ*, to very wide variation, which does not seem to depend much on climate or season. I have reared very different varieties from larvæ taken at one time in the same spot, if not on the same plant. The larva feeds on a small climbing caper which is very common on the hilly parts of Bombay. (Young plant of *C. horrida?*) It is nearly cylindrical, slender and of a uniform green colour, with the rough surface characteristic of the larvæ of *Catopsilia* and *Terias.* The pupa has a sharp transverse ridge above, at the junction of the thorax and abdomen, which extends well beyond the general outline on each side, forming a pointed lateral process. From this a dorsal ridge runs out into a similar point just over and behind the head. The colour is light green, with a triangular patch of yellowish white on the anterior side of each lateral process and a similar patch covering the top of the head. This species is in season at the commencement of the hot weather.

90. *T. cypræa.* This occurs sparingly in Bombay, but is common in May and again at the close of the year among the salt works on the mainland across the harbour, where I have found the larva in November and December feeding on a tree, called by the natives *Sairi,* fond of briny situations. I have persecuted the Botanical Section for its name without success.* It is slender, cylindrical and rough on the upper surface like the larva of *Terisa.* On examination with a strong lens this roughness proves to be due to minute tubercles, out of each of which grows a short black bristle. Each side, above the base of the legs, is fringed with somewhat longer white hairs. The colour is grass green above, with a dark blue dorsal line very narrowly bordered with yellow. The under side is a paler bottle green, a lateral yellowish line separating the two tints. The pupa is very similar in form to that of *Terias* and of a dingy whitey-brown colour. The aspect of this pupa confirms my general impression that this species is much nearer to *Terias* than to some of the species with which it has been lumped under the name *Teracolus.*

91. *T. dynamene.* Mr. Newnham sent a number of these from Bhooj, and I found it common at Kharaghora on the borders of the Runn of Cutch in the hot season.

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* *Avicennia tomontoso*—A white-flowered variety of Mangrove.—K. B. KIRTIKAR, Botanical Secretary.

92. *T. puéllaris.* I found this also at Kharaghora in company with the last. They were always flitting about the wild caper (*C. aphylla*) which formed the most prominent feature of the vegetation in that wilderness, and I have no doubt now that they were laying their eggs on it.

93. *T. protractus.* For our specimens of this we are indebted to Mr. Newnham at Bhooj.

94. *T. fausta.* I found this at Kharaghora in the rainy season. We have it from Bhooj too. This and the last three are purely desert insects and are out of place in this collection; but the few butterflies we have from Cutch have been temporarily included in the collection representing Bombay and the Deccan.

95. *T. fulvia.* } There is one specimen of each without
96. *T. tripunctata.* } note of locality.

97. *Appias libythea.* This is very common in Bombay about the beginning of the hot season, that is to say in "spring." I have found the larvæ in April on more than one common plant of the caper tribe. It is at first sight like that of *T. etrida,* but the anal extremity tapers slightly and ends in a bifid projection. The pupa is exactly like that of *T. etrida* in form, but different in colour, being pale watery green with numerous dark spots.

98. *Belenois mesentina.* This is pretty common everywhere, and long ago I found the larvæ of it on a plant which from my recollection of it must have been *Cadaba indica.* Capers are evidently wholesome to the pierine constitution. Unfortunately I kept no notes then, but I recollect the larva as clothed sparingly with soft hair, like that of D. *eucharis.*

99. *Huphina phryne.* This is another species which from my point of view has been most needlessly split up. It is one of the few species of which it may with truth be said that it is in season all the year round. It is as common on the hills as on the plains.

100. *Delias eucharis.*—This is common all the year except during the months of heavy rain. It rises early in the morning and flies high, but not fast. The larva feeds on the common mistletoe, *Loranthus longiflorus,* which grows on mango and most other trees everywhere. Unlike nearly all other butterflies and like moths, this species lays its eggs not singly, but together, in regular rows. The larvæ are gregarious when young and soon clear a small *Loranthus* of its leaves, and the habit which they have of letting themselves down by their silk when disturbed is no doubt

connected with the necessity so often imposed on them of travelling in search of fresh pastures. I do not think birds eat them, but they are the victims of a dipterous parasite, in appearance not unlike a house fly. Immediately after the caterpillar has become a pupa, the larvæ of the parasite, of which there may be half a dozen, undergo the same change within its shell and the beautiful bright yellow pupa at once turns black.

101. *Nepheronia gaea.*—This is very common in Bombay at the close of the monsoon and for some time after. It frequents lanes and hedges, especially where there is water and plenty of verdure.

102. *Pontia xiphia.*—This comes out about the close of the rainy season and continues all through the cold months. About shady lanes and hedges it is sometimes very abundant, flying low and settling constantly. I think it occurs throughout the Presidency, wherever there is sufficient moisture and vegetation.

103. *Catopsilia.*—This perplexing genus is poorly represented in the collection, and I must annotate on it as a whole, never having been able to form an opinion for myself as to how many distinct species there really are (I mean in nature, not in museums). *Pyranthe* keeps itself quite distinct, laying its eggs on a small annual shrub (*Cassia occidentalis*); but the larger species fly high and fast, are indistinguishable on the wing and appear to feed indiscriminately on several leguminous trees, and as the larvæ resemble each other strongly, it is almost impossible to settle anything by breeding unless one could induce the insect to lay its eggs in captivity, which I fancy would be difficult.

This genus differs from all the preceding in one point of attitude, namely that, when at rest, it sits upright with wings firmly closed. The habit of migrating westwards has often been noticed. I have observed these migrations in September, and always I think in the face of a strong west wind.

104. *Terias laeta.*—This species, though by no means so abundant as the next, is common enough about Bombay at the end of the rainy season and for some time after. It varies little compared with the next.

105. *T. hecabe.*—Till some one arises with leisure and abilty to rescue this genus from the chaos into which it has been plunged by reckless species-making, everything which is not *laeta* must go as *hecabe*. I am disposed from my own observation to believe in a third species, smaller and more dusky than *hecabe*, which swarms

about grassy plains during the monsoon, laying its eggs on a minute leguminous weed among the grass. *Hecabe* proper feeds on several leguminous plants, but seems to forsake all else for *Sesbania aculeata,* already mentioned as the food of *Tarucus plinius.*

HESPERIIDÆ.

The *Hesperiidæ* seem to me to be very much over classified. Nothing is gained by dividing a group of butterflies so much alike in all stages of their existence into such a multitude of genera, and I very much doubt whether it will not be found necessary, as our knowledge of their life history advances, to re-arrange the whole family, dividing some of the present genera and uniting others.

106. *Gangara thyrsis.*—I do not think I have met with this species out of Bombay, and there it is capriciously distributed, being common in some gardens and absent from others. It comes out before dawn and after sunset, and is always at flowers, particularly those of lilies.

107. *Pratapa alexis.*—This species is very abundant in the country surrounding Bombay during the rains. I have found it also in fields of lucerne grass in Poona during the hot weather in company with the next. It feeds chiefly in the morning. As the stout thorax indicates, it is one of the strongest of butterflies on the wing.

108. *Badumia exclamationis.*—This is common everywhere while the rain lasts, swarming about *duranta* and other plants with small flowers, especially in the early morning. When crossing the Bombay harbour about the month of September one meets hundreds of *hesperiidæ* flying over the sea, this being one of the most plentiful.

110. *Parnara naroda.* —I know little about this. We have two specimens.

P. bada.—We have only one specimen.

110. *C. mathias.*—This is about the commonest of the family during the rains. The larva feeds on a common grass, stitching the edges of a leaf together so as to form a tube, in which it lives, coming out to feed at night. It passes the pupa state in the same shelter.

111. *C. agna.*—I believe I have bred this on rice. The larvæ has the same habit as the last.

112. *Suastus gremius.*— This is not uncommon in Bombay and Poona, being very similar in habits to the last two.

113. *Isoteinon nilgiriana.*—The specimens in the collection were contributed by Mr. Wroughton, I believe, from the Tanna District. I know nothing about it.

114. *Telicota augias.*—We have one specimen only, caught by Mr. Wroughton at Nasik.

115. *Padraona dara.*—The same gentleman contributed this species from the Nasik District.

116. *Astictopterus salsala.*—There are a few specimens of this, without note of locality. I have found it in Bombay.

117. *Taractrocera ceramas.*—I got a few specimens of this at Egutpoora in October.

118. *Ampittia coras.*—This is not rare anywhere during the monsoon, but difficult to see and more difficult to keep sight of, as it flies fast, but very low, and alights on the ground.

119. *Udaspes folus.*—This is chiefly a hill species, very common on the ghauts in shady lanes early in the morning.

120. *Pyrgus galba.*—There are specimens in the collection from the Tanna District and also from Cutch, the former being conspicuously larger and darker than the latter. I have never met with it.

121. *Abaratha ransonettii.*—We have only one specimen, which I caught at Egutpoora in October 1885.

122. *A. Tissa.*—Our two specimens of this were caught by Mr. Wroughton at Bansda between the Surat and Tanna districts.

123. *Pterygospidea angulata.*—I saw two or three specimens of this at Mahabaleshwar last March and caught one. They were flying about at noon and resting on flowers with wings expended.

124. *Plesioneura amberesa.*—This comes out in March and in suitable situations is very abundant. I have found it in Bombay, on Karanja Island and at all the hill stations. It is quite a moth in its habits, taking shelter during the day in the house and flying by night.

125. *P. Alysos.*—I caught a single specimen of this at Mahabaleshwar last March. It has no business to be in the same genus as the last. It closes its wings when at rest.

126. *Sarangesa purendra.*—This is a miniature of *P. ambaresa* in all respects. Like that species it frequents rocky places and when resting on a stone is difficult to detect. It is to be found almost everywhere.

127. *S. Dasahapa.*—Mr. Wroughton took two specimens of this at Bassein in the Tanna District.

In concluding these very superficial notes I must acknowledge my indebtedness to Mr. L. de Nicéville and also to Colonel C. Swinhoe for that assistance in naming specimens without which a mere collector like myself could not have proceeded many steps.

NOTES ON "THE WATERS OF WESTERN INDIA."

By Mr. J. D. Inverarity.

The interesting article on the above subject by Keswal in the October number of the Society's Journal induces me to send you a few rough notes taken from my journal which I think will prove that some of the birds mentioned by Keswal as not occurring in the Konkan are to be found there.

The Indian Golden Plover.—This bird, I should say, is fairly common about the salt lands and rice fields bordering the numerous creeks that run up from the Bombay Harbour. The first I remember seeing, were on the Bombay flats in October 1877. I saw three and shot a couple on the site of the present race-course. In a subsequent year, I think March 1883, I saw a flock of about a dozen close to the race-course one evening when I was riding. I approached quite close to them two or three times, and have no doubt they were *golden plovers.* I have also shot them as follows:—February 1878, 4½ couple near Panwell; December 1878, 1½ couple on the Tanna creek; November 1880, 2 couple near Tullooja; February 1881, 2½ couple near Panwell; February 1884, 1 couple near Panwell; November 1886, 2 couple near Penn. In fact, I may say, I have seen some every year I have been shooting. I was at home in the cold weather of 1879-80, 1882-83 and 1884-85, which accounts for my having no note of them in those seasons.

The Bittern.—The large true bittern I have shot several times, though in some years they don't put in an appearance. In October 1877 I shot one on the Bombay flats close to the site of the present James Greaves Spinning Mill; January 1878, saw one on the Bhewndy Tank; February 1878, shot one at Panwell; February 1881, one shot at Panwell; November 1883, two shot at Tullooja; December 1883, two shot at Deo near Panwell; February 1884, one shot at Panwell. I have seen two or three others besides of which I have no note as to dates.

The Chesnut Bittern (*Ardetta cinnamomea*)—is fairly common. I have seen several, but have seldom fired at them. I have shot them at Gorebunder, and shot one near Penn on November 28th, 1886.

The Stone Plover (*Bastard Florican*).—Rare. I have only shot one at Panwell and don't remember having seen another.

The black-tailed Godwit.—I have only once seen one, a solitary bird. I shot it in February 1884 among the salt pans at Penn.

The Avocet—does not occur, I think, about the Bombay Harbour. I have seen several and shot a few in the creeks near Udwara and Billimoria.

The Purple Coot.—Large numbers are to be found on the Bhewndy Tank. I saw three and shot one on the Vehar Lake.

The Bald Coot.—Quite common, large flocks on the Bhewndy Tank, Panwell Tank, Vehar Lake, on several small tanks near Callian, Panwell, Penn. Bald coots are always to be found in the cold weather; not having visited them at other times of the year, I can't say if they remain there.

Rails and Crakes.—A large variety are to be found in the paddy fields across the harbour before the rice is cut. I am unable to particularize them as I have seldom fired at them. The spotted crake (*Porzana Maruetta*), I know, is pretty common; I have shot it occasionally.

Curlew.—I saw a curlew on the Bombay race-course on September 26th, 1886.

The Cotton Teal.—This duck certainly bred this year in the paddy fields near Indune. I shot several, some of them young birds, of this year on November 3rd, and also saw a young one alive, unable to fly, in the possession of a villager who had caught it.

The Nukta.—A young bird of this year was shot by Mr. Leslie Crawford in my presence on a small tank not far from Penn on November 28th. It was a solitary one. I have not seen the nukta here before. On the same tank, at the same time, I shot a tufted pochard, also a solitary one. I sent the latter to the Society. It had a bright golden eye, so I am sure it was the tufted pochard. Mr. Aitken at first thought it was a white-eyed pochard.

The Scaup Duck.—I shot a female on a small tank near Panwell on January 13th, 1884. I believe this is the only instance of a scaup duck being shot in the Bombay Presidency, though I believe a few have been procured at Kurrachee.

The following ducks have all been shot by me about Bombay:—

The whistling teal, the shoveller, the gadwall, the common teal, the garganey teal, the pochard or dun bird, the white-eyed pochard, to which list may be added the nukta, the tufted pochard and the scaup mentioned above. The shell drake, the Brahminy, the mallard, the spot-billed duck, the pintail and the wigeon, I have not come across near Bombay.

The whistling teal and cotton teal, I think, breed in some tanks a few miles from Narel; as least I have seen large numbers there.

The pheasant-tailed Jacana.—I have seen numbers of these birds on the tanks at Callian.

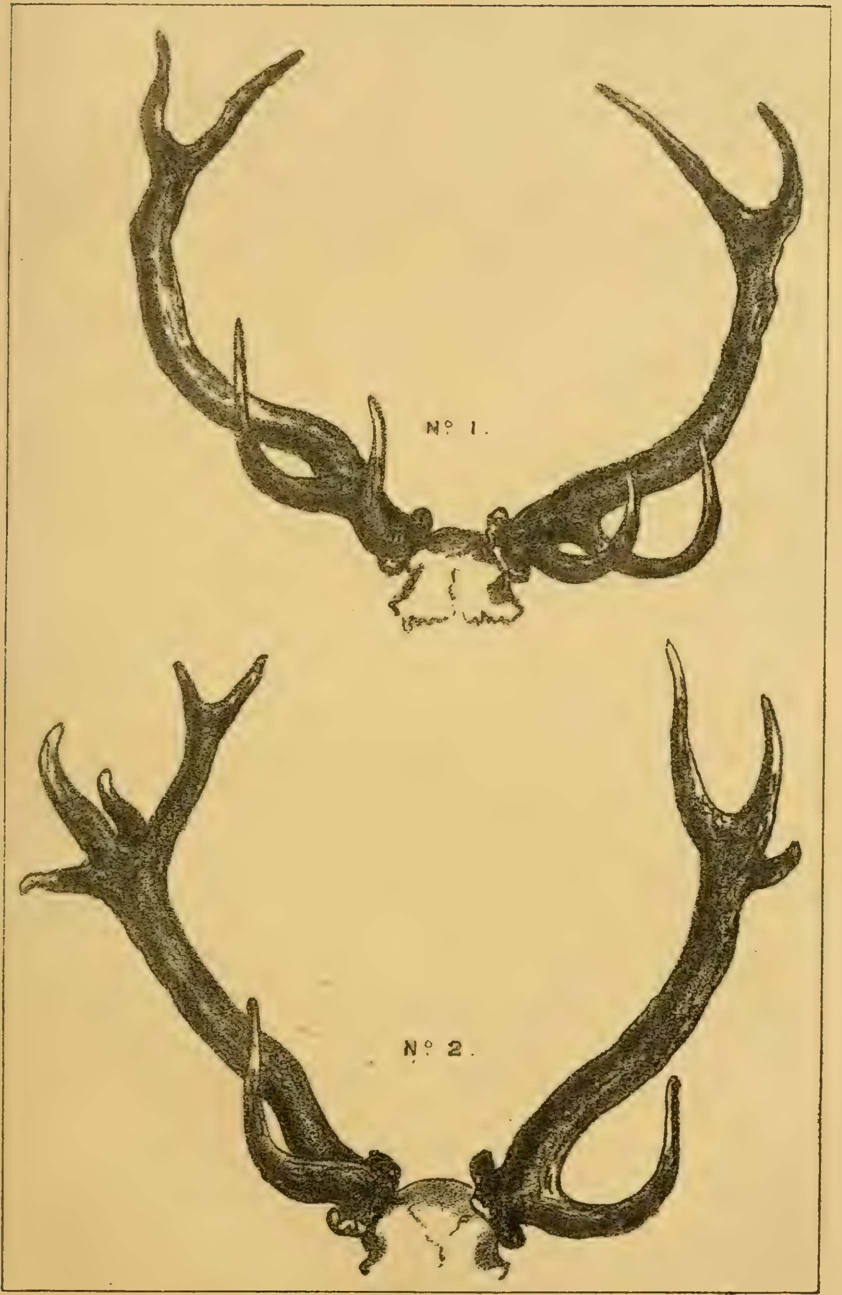
The Woodcock.—One was shot near Tanna in 1878. I saw the skin. (See *Stray Feathers*, Vol. 7, p. 525).

I hope that other members of the Society, who have more time at their disposal than I have, will send to the Society's Journal anything worth recording that they may have observed.

SOME FURTHER NOTES ON ABNORMAL HORNS.

By the Editor.

One of the most interesting cases of abnormality that has come before me lately is that of a doe-antelope, *A. bezoartica*, of which I give an illustration. The females of this species, as in the case of most of the *Cervidæ* and *Antelopinæ*, are hornless, but this specimen exhibits a pair of very symmetrical horns, ringed, but not spiral, situated on well-formed bony cores and diverging outwards, downwards, and forwards like those of a wild sheep. The horns are thin, about 1 inch in diameter, and about 22 inches in length. They belong unmistakably to a doe, and not to a young male. The skin has well-defined traces of the mammæ. The animal was shot by native shikaris, and the head and skin, which are the property of H. H. the Maharajah of Jodhpore, were sent here for inspection. It is to be regretted that we had not the creature in the flesh, for dissection would probably have shown abnormal conditions, either hermaphroditism or ovarian disease. In the Linn. Transactions, Vol. II., it is recorded that a female doe with a single horn resembling that of a three-year old buck, was found on dissection to have the ovary of the same side scirrhous. An interesting



ABNORMAL SAMBAR HORNS.

fact regarding the production of malformed horns has recently been brought to my notice by Dr. A. Barry, at present Superintendent of Matheran. It bears on the probable influence that certain injuries may exert on the growth of antlers. We know that a common operation will stop the growth in the young male, or cause a deteriorated horn in the adult, which remains permanent, and is not shed annually. Dr. Barry had a tame Cheetal stag, with fine horns of normal shape. He had a severe accident, breaking one of his *hind* legs; the following and successive years the antler on the side opposite to his injured leg was deformed. Now against this I bring forward a case of another Cheetal stag in the Kurrachee Gardens. This creature jumped out of a window, and broke one of his *fore* legs, the injury had no effect whatever on his horns. In Dr. Barry's stag the injury was probably communicated sympathetically to the internal organs, and such cases may be more frequent in the jungles than we imagine, and so lead to the numerous examples we have collected of abnormal antlers. I have figured on stone, from water colour sketches by Major G. R. R. Poole, of the 12th Lancers, two very curious Sambar horns, very massive and large, which he saw hung up in the outer Court of the Jeypore Museum. He wrote—"The thick ten-pointed one is a Sambar, without doubt, the other eight-pointed one is, I believe, a Sambar. I know the Kashmir stag well, and do not think it was one. The heads were hung so high that I could not get at them, but should say the massive one was about 40 inches, or getting on for it. The other seemed two or three inches longer." It is doubtful whether the latter is not an immature horn of *Cervus Cashmirianus,* but I am inclined to think not from its size. If, therefore, it be a Sambar, it shows a curious progression from the Rusine to the Cervine or Elaphine type, the bez-tines being of perfectly normal shape and size it only requires the addition of a tres-tine to make it an Elaphine antler. I have written to enquire further about these horns.

R. A. S.

NEW SPECIES OF FISH FROM KURRACHEE AND THE PERSIAN GULF.

By James A. Murray, late Curator of the Kurrachee Museum.

SALARIAS PULCHER—Sp. nov.

Head vertically rounded in front with a pair of inter-orbital tentacles, none on the nape; eyes placed forward, the orbital ridge in front projecting, and the inter-orbital space above the tentacles concave. No crest on the head. The maxilla reaches to below the middle of the eye. No canines. Dorsal fin divided by a notch and with $\frac{13}{19}$ spines and rays, not continuous with the caudal; 8th to 11th spines of first dorsal with free rays projecting beyond the membrane. Anal fin with 20 rays; caudal with free rays. Head $\frac{1}{7}$th of the total length; height of body a little more than $\frac{1}{4}$th. Pectoral laid forward reaches a little beyond the hind edge of the eye.

Colors.—Anterior two-thirds chocolate brown; posterior third golden yellow, with 5—7 vertical dark bars. Caudal pale yellow slightly edged with brown. Dorsal fin with a dark spot on the upper edge between the 1st and 2nd spines; a second also on the upper edge between the 2nd and 3rd spines. A third ovate spot mesially between the 5th and 6th spines; a fourth at base of 7th spine; a fifth on the upper edge enveloping the 7th and 8th spines, a sixth also on the upper edge enveloping the 9th, 10th, and 11th spines. Base of 1st dorsal brown; 2nd dorsal unmarked; pectoral pale yellow; anal white anteriorly and pale yellow posteriorly; slightly bordered with brown.

A second specimen agrees with the above description in every particular, except that there is only a spot between the 2nd and 3rd spines, and another on the 7th and 8th spines, the others being absent, owing probably to age.

Hab.—Kurrachee, Manora.

SALARIAS OPERCULARIS—*Sp. nov.*

D. $\frac{12}{16\text{-}17}$; Anal 18-19.

The highest part of the body equals the distance between the snout and hind margin of the branchiostegals, and is $4\frac{1}{2}$ to $4\frac{3}{4}$ times in the total length. The forehead does not project in line with the snout. A pair of simple tentacles at the nostril, another above the orbit. A curved canine on each side of the lower jaw behind the series of small teeth. Inter-orbital space concave, its width less than the diameter of the eye; the maxilla extends to below the middle of the eye. Dorsal fin notched and not continuous with the caudal, both portions of nearly equal height. Anal fin not as high as the body.

Colors.—Body pale fleshy with seven vertical brown bands extending to the upper edge of the dorsal; 1st dorsal with a dark spot on the upper edge between the 1st and 2nd spines. Anal rays ciliated and narrowly edged with brown. A dark patch on the opercle and an oblique streak below it behind the maxilla, and another vertical one immediately below the middle of the eye.

In the adolescent and young these streaks are continued to below the chin, and in the interspace between these two lines are two subtriangular dark spots.

Hab.—Kurrachee (Manora rocks).

PSEUDOCHROMIS PERSICUS—Sp. nov.

B. 5 D. $\frac{3}{30}$; Vent $\frac{1}{5}$; Pect. 18; L.l. $\frac{55}{10}$, not continuous; Anal $\frac{3}{19}$; L. T. 15. The height of the body equals the distance between the snout and the extreme hind edge of the preopercle, and is $4\frac{1}{2}$ times in the total length.

Length of snout equal to the diameter of the eye. Opercles scaly. Dorsal and anal fins produced posteriorly and pointed. All the rays of the anal, pectoral, ventral, caudal and the posterior rays of the dorsal branched; caudal fin covered with scales for one-half its length.

Colors.—Pale fleshy on the body. Head and snout brown, two longitudinal pale bluish white lines on the preopercle; a black spot behind the opercle with a vertical bluish white line through it, in its anterior third. Body covered with scattered blue spots. Dorsal, anal, and caudal fins with faint blue spots, not unlike broken up undulating lines. The young has a dark brown line running from the snout through the eye to the end of the dorsal fin, which disappears with age.

Hab.—The Persian Gulf. I am indebted to Captain Bishop, of the I. G. S. Patrick Stewart, for specimens of this fish, which were collected by him in the Persian Gulf, when repairing the Indo-European Telegraph cable.

DESCRIPTION OF A NEW LIZARD FROM THE DANGS.

By F. Gleadow.

HEMIDACYLUS MURRAYI, *Sp. nov.*

Digits quite free; free distal joints of digits long; dorsal tubercles strongly keeled; not more than 8 *lamellæ under the inner toe and* 11 *under the median toe;* 5 (4—6) *lamellæ under the inner, and* 8 (7—9) *under the median toe. Tubercles in* 16—20 (14—22) *longitudinal series.*

Males with 6—8 *femoral pores on each side.*

Snout longer than distance between eye and ear opening, about $1\frac{1}{4}$ the diameter of orbit. Forehead concave. Ear opening oblique, less than half the diameter of the eye. Digits moderately dilated, the inner well developed. Rostral grooved, slightly broader than high. Upper labials 10—12. Lower labials 9—10. Nostril between the rostral, first labial, and three small tubercles similar to those on the muzzle. Back of head, and between eye and ear-opening, granular, with scattered conical or rounded tubercles. Eyelid distinct, granular. Pupil vertical. Chin-shields two pair, the first largest and in contact with the triangular mental and first labials. Second pair smaller opposite the second labials, reaching their posterior suture, but sometimes touching the first labials. Mental broader than the rostral. A row of decidedly enlarged scales along the lower labials, followed interiorly by others diminishing in size. Chin and throat with small granular scales. Upper labials bordered by a distinct row of tubercles slightly longer than those on the muzzle. Tubercles on the muzzle closely packed, smallest in front of the eye. Scales across middle of abdomen in 32—36 rows, each scale minutely 3—10 dotted. Back covered with granular scales interspersed with 16—20 (14—22) rows of keeled trihedral tubercles more conical on the flanks, and all less than half the diameter of the ear-opening in size. Limbs with scattered keeled tubercles. Tail longer than head and body, verticillate, grooved medially above, as far as 10 or more verticels. The first few verticels with 3—4 sharp conical keeled tubercles on each side, decreasing in number and size towards the tip. Sub-caudals enlarged, about 50—60 in number to tip of tail. Femoral pores 6—8 on each side, interrupted in the middle. The foreleg laid forward reaches nearly the nostril. Inner toe with 5 (4—6) lamellæ below. Median toe with 8 (7—9) lamellæ.

Color grey, with several dark bands across the back, the bands shaped somewhat like two crescents back to back, thus $\genfrac{}{}{0pt}{}{\smile}{\frown}$. Markings frequently variable or indistinct. A dark streak from nostril to eye, with three others diverging behind the orbit, the upper one sometimes produced over the shoulder; underparts white; tail banded.

Length—Head and body 65 mm. ($2\frac{3}{4}$ in), tail 75 mm. (3 in).

The above description is taken from 24 specimens, 8 males and 16 females, forming a nearly pure gathering from two localities, Pimpri and Garvi, in the "Dangs," a forest and mountainous region of about 1,000 sq. miles, with a rainfall of about 100 inches, at the north-west extremity of the Syhadri or Ghat range, between Khandesh and Surat. The animal inhabits both trees and houses, living under loose bark, and in nooks and crannies. Its habits are chiefly nocturnal, though it may be caught in the day time. I believe I have it also from the town of Surat, but this locality requires confirmation.

I desire to name this new species after Mr. J. A. Murray, to whom I am indebted for a great deal of willing assistance during the past.

ZOOLOGICAL NOTES.

Delphinus lentiginosus. I have received a letter from Mr. Sinclair announcing the capture of a fine Delphinus on the Alibag Coast, which apparently is *lentiginosus*, and if so it is a very fine specimen, the skin of which is an acquisition to our Museum. The average length of this species is from seven to eight feet. I give Mr. Sinclair's careful measurements and description :—

Adult Male—Length between standards	10′	6″
* Greatest height exclusive of dorsal fin	1′	5″
Greatest circumference of pectoral region exclusive of fins	4′	3″
Height of dorsal fin		8″
Base length of dorsal, true horizontal	2′	3″
Extreme length of flipper, from front of axilla to tip	1′	3″
Greatest depth of fluke parallel to spine		9″
Greatest expanse of flukes	2′	3″

(Note that this is identical with base length of dorsal fin.)

Length of rostrum (restricted) 8″. Spiracle single, fairly large, cresentic. A vertical line drawn through its posterior angles would cut the anterior angles of the eyes. Teeth numerous in both jaws, conical, not yet counted.

The shape is that of the genus; the caudal region is very much compressed, and its inferior and superior surfaces produced into what might be called rudimentary anal and dorsal fins.

Colour—Above (and below behind the anus) rather pale leaden gray, with numerous long drop-shaped spots. Of these the majority, especially on the rostum, limbs, dorsal fin, and flukes, are pure white, the rest dark slate color or black.

Below, from the anus forward the general ground colour is white, much mottled on the belly with the dorsal ground colour, less so on the breast, and the mental region almost pure white; but there are a few black spots.

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* This of course would be much greater in the water, the weight of the animal in shore depressing the anterior parts.

Contents of stomach a few small crustacea.

The specimen was caught in a drift net in the offing of Alibag.

The dental formula which he sent me in a subsequent letter gives $\frac{36}{34} — \frac{36}{34}$.

The specimens reported on by Professor Owen had $\frac{32}{32} — \frac{33}{32} = 129$, which differs somewhat, but I find that much stress must not be laid on the teeth in Dolphins. *Delphinus gadamu* varies in individuals from 96 to 108 teeth.

R. A. STERNDALE.

NEST AND EGGS OF *CINNYRIS LOTENIA*.

As far as I know there is nothing on record about the breeding of this sunbird, and since I went to Uran on the so-called Island of Karanja, where the bird is not uncommon, I have been on the watch for its nest. It is a permanent resident, frequenting the sides of the hills, and incessantly uttering the loud cheery note which serves at once to distinguish it from the other members of its family. It seems fonder of flowers than either *asiatica* or *zeylonica*, and often hovers over them like a hawkmoth, inserting its long tongue.

In October I suspected strongly that a pair had a nest somewhere in a well-wooded slope close to my house, but I did not succeed in finding it. Later on I saw a pair followed by two young ones, and my heart sank within me. But the birds themselves came to the aid of science, and, about the beginning of November, made a beautiful nest in the middle of a small tree close to my verandah. I had to watch it carefully, for there was a pair of *zeylonica* in the garden. However, the birds were not shy, and I soon had abundance of opportunity of assuring myself about the ownership of the nest. As I frequently saw the female going in and out, I concluded the eggs were not yet laid ; so I waited a week and then one morning I went cautiously up and touched the nest with a long stick. In a moment the bird darted out and flew round and round me, screaming and calling all the birds of the neighbourhood together. It is one of my rules not to take nests in my own garden, but on this occasion I thought the rule would be more honoured in the breach than the observance, so I mounted a chair and cut the nest down. What was my horror on discovering that it contained one egg and one young one, just hatched. I plunged the other egg at once into cold water, and left it in it for five minutes in order to kill the chick, if there should be one. Alas! next evening, thirty-six hours after, this egg too was broken, and a little naked thing was struggling to get out. I have therefore only the broken shell of one egg and the nest for my spoil. The nest, as you see, is remarkably long, measuring fully ten inches. Otherwise it is very similar to that of *zeylonica*, having the entrance near the top, protected by a portico. It is constructed of fine fibres and grass, and covered all over with small pieces of bark and other rubbish, chiefly that favourite material with all sunbirds, the woody refuse with which wood-boring caterpillars cover the entrances of their holes.

The egg is not an ornamental one. The ground colour is a dirty brownish white, the smaller end being thickly covered with dull brown spots, which pass into larger confluent blotches and form a cap on the other end.

E. H. AITKEN.

THE CAT AND THE SQUIRREL—A FOSTER-MATERNAL FREAK.

We have all heard of Romulus and Remus being suckled by a she-wolf and similar, and perhaps better authenticated, stories. But until a few days ago I never had the chance to see a cat nursing a squirrel.

First I must tell the adventures of the cat, the heroine of the tale. One evening, when dressing for dinner, I threw a garment into my dirty clothes basket. Out bounced a cat to my great surprise and temporary discomfiture. Hearing faint squeaks from the basket I looked in and saw three little kittens snugly nestled in the folds of crumpled shirts and other things. The outraged mother, a cat of decent appearance, with perhaps a dash of Persian blood in her, had belonged to a friend next door, but on his departure, had been left behind, as cats too frequently are, to become a homeless vagabond. Though keenly sympathising with the cat and her troubles, it was out of the question that she should be allowed to make my clothes basket a lying-in hospital. Her feelings towards me were no doubt similar to those entertained by Calverley's cat towards the pot boy who

"Peep'd with a scared wan face ;
Then sent a random brick-bat down which knocked her into space.
Had I, as some cats have, nine tails, how gladly would I lick
The hand and person generally, of him who heaved that brick."

However I did not heave a brick at her. I only had the kittens firmly but tenderly ejected, and sent off to the back premises of the next house, where the cat was supposed to have her domicile. But the cat had National League ideas, and was not going to submit tamely to eviction. On my returning from dining out, there she was again with all her family complete in my clothes basket. The process of eviction was then repeated, the kittens deposited as before in the verandah of the cook-room next door. To make re-entry impossible, I put the lid on the basket, shut the door and window of my dressing-room, and went to bed. I certainly thought I had got rid of the family this time. But the old cat was not to be done so easily. "Give up? give up, be blowed," said she. Next morning cat and kittens were found calmly established on a pile of magazines on a book shelf in my office. Summary eviction was again necessary, but this time my wife interceded, and accommodated the family with a box in the verandah close by; there a few hours afterwards one kitten died, and a fourth was born and took its place.

Why the cat had such strong opinions as to the propriety of bringing up her vagabond progeny in my house I can't conceive. We had never taken the slightest notice of her, and her appearance, before this episode occurred, would certainly have resulted in her being introduced to a couple of fox-terriers, whose manners, in the presence of cats, are more forcible than polite.

Now comes the squirrel part of the story. On the day following the installation of the cat in the box in the verandah, my wife found a tiny baby squirrel (*Sciurus palmarum*) clinging to a creeper in the porch. It had no doubt tumbled out of its nest somewhere in the eaves. It looked the picture of misery, shivering and woe-begone. Happy thought! Put the little waif in with the kittens. As the old lady was out on the rampage at the time, no sooner said than done.

Whether the cat would welcome the intruder seemed very doubtful, and until her return the fate of the foundling trembled in the balance. The cat *might* say—

"They call me cruel. Do I know if mouse or squirrel feels?
"I only know they make me light and salutary meals.
"And if, as 'tis my nature to, ere I devour I tease 'em.
"Why should a low-bred gardener's boy pursue me with a besom?"

Our suspicions of what the cat might say or do was groundless. An hour later the foundling was seen comfortably sucking the cat, going shares with the kittens, and holding its own, as if the whole place belonged to it. The cat was purring contentedly and seemed to think it all right. Four whole days have passed since the foundling made acquaintance with the *Amah,* and it appears to be sleek and thriving. It certainly gets its fair share of the cat's attentions, and although not a quarter the weight of its foster brothers, is much too 'cute and active to be crowded out at meal time.

The cat has made one attempt since this addition to her family cares, to regain her old stronghold, the clothes basket. She deposited one of her kittens on the floor close by the basket. She couldn't get in as the lid was shut, but she left the kitten down below it, as a last mute appeal to our good feelings. But we were obdurate, and replaced the kitten in the box. At present she appears outwardly satisfied, but I have no doubt she'll try it on again, if ever she finds the cover off the basket.

G. VIDAL.

Poona, 21*st October* 1886.

Editor's Note.—Mr. Vidal in a subsequent letter informed me that the interesting family had come to an untimely end, owing to his dogs having discovered the box.

R. A. S.

NOTES ON THE HABITS OF *NEPITA CONFERTA*.

Among all orders of insects are found many very interesting habits with relation to self-preservation. The insect in question is a small moth of the family Lithasudæ.

Having lately bred several specimens, I was much struck with the manner of preserving the chrysalis from the attacks of ants. The larva of *Nepita Conferta* is a small hairy caterpillar of a dull brown colour, having a creamy mark on the 3rd and 4th segments. It feeds on mosses, and may be found on the walls of almost any house where a damp spot encourages their growth.

When full grown the larva ascends the wall, and in a very prominent position makes a slight web interspersed with its own hairs.

The change from larva to pupa takes place within this web. Now a chrysalis which was merely enclosed in so slight a protection would soon be destroyed by the numerous ants, who are ever on the prowl. To guard against this evil, before making the light web, the larva encloses a small space with a wall of hair.

This wall is constructed in the following manner:—

The hairs are placed on one end, with the other end pointing outwards, one hair having been placed, and made fast to the wall of the house, another is placed crossing it, also having its end pointing outwards. In this way the insect continues until a space is enclosed by the wall thus made, any body who may be incautious enough to touch this wall of hairs with their hands will repent, for the hairs having fine sharp points at once enter the skin, and becoming detached from the wall remain in the skin causing an intolerable itch with great swelling.

I had a box with one of these cocoons in it, which was tightly closed and placed in an inner room. On going into this room one day, I was surprised to find a great many *confertas* busily flying round the closed box; on opening it, to find out the cause, I found my moth had just come out a perfect female; all those flying in the room were males.

Apart from the extraordinary fact of the males having found out that there was a female there, their mode of ingress was curious, as to get into the room they had first to pass through a doorway opposite which a chick was suspended, they had then to cross the outer room and go through another doorway before they were in the room which contained the prisoner. I made good use of this habit by leaving her where she was and selecting the best specimens of males in the room.

This habit of finding out and coming to a female in captivity is even more strongly developed in one of our English moths, which is commonly known as the Oak Egger.

On one occasion in a single day I captured over thirty male Oak Eggers with one female, and have no doubt I could have taken fifty. There is yet another use to which *Nepita Conferta* apparently puts the hairy wall, for I have seen several cases of the female laying her eggs on top of the deserted cocoon.

The perfect insect is on the wing during June, and another brood appears in August.

CARWAR, H. S. WISE.
September 1*st*, 1886.

BIRD-NESTING NOTES FROM CUTCH.

I can corroborate Mr. Littledale's assertion that *C. affinis* (the Indian swift) takes possession of the nests of *H. erythropygius* (the Red-rumped Swallow) for on March 6, in Bhujia Fort, I caught two of these swifts in separate nests of *H. erythropygia*. One nest contained two fresh eggs, but the other was empty. *C. affinis* is not the only bird however that avails itself of the ingenious nest of *H. erythropygia*. On April 25 I took 3 eggs of *P. flavicollis* (the yellow-throated Sparrow) out of one of them. To make quite sure of its identity, I shot one of the parent birds. Also I am nearly certain that some eggs which my shikari brought me last year out of a nest of *Ploceus munyar* (striated Weaver bird) must have belonged to this species, *i.e.*, *P. flavicollis*, but I never had an opportunity of seeing the bird. April 15 I shot a pair of *Strix Javanica* (the Indian screech owl) which, as far as I know, has not been recorded from this province before. The female on dissection showed no signs of nidification. Since then I have seen a third. Within the last month, *i.e.*, April I have seen Peregrine Falcons on two occasions, and also *C. aeruginosus* (the Marsh Harrier). Surely this is very late for winter visitants to be stopping, unless they are breeding. May 2 I found a partridge's nest in a very unusual situation. It was placed in a hole in the rock about 10 feet from the ground. I climbed up and found it contained eggs, and as far as I could feel with my hand, there was no attempt at a nest, the eggs being laid on the bare sand. I may mention that I saw the bird to be the ordinary grey partridge, *P. pondicerianus*. April 25 I first observed *T. pagodarum* (the Brahminy Mynah) which I had been looking out for for some time. I have never seen them in the cold weather, so I conclude they only come here to breed. Last year I took four of their nests.

A. NEWNHAM, 10th N. L. I.

THE TWO SHAMAS.

Mr. Hume, speaking of the Shama (476 *Cercotrichas macrura*), says:—" Well might Jerdon doubt that Philipps' Shama described as perching on walls and breeding in houses, could be this species."

" *Shama* " is the native name for the Brown Rockchat (494, *Cercomela fusca*) throughout the Central Provinces, and it is this bird that Philipps was writing about, and not our delightful Indian songster.

" Perching on walls and breeding in houses " is a concise summary of its habits.

H. EDWIN BARNES.

MERGUS MERGANSER.

It will interest the ornithological members of the Society to know that I shot a goosander (*Mergus merganser*) at Shewa just across the Bombay harbour, on the 2nd instant (December). It was a female or immature male, and was playing along in a shallow sheet of salt water which formed the reservoir of one of the salt works. I believe this is the most southern point in India from which the bird has been recorded yet.

E. H. AITKEN.

LIST OF BIRDS FROM SIND.

Presented by Colonel Swinhoe.

Jerdon's No.	English name.	Scientific name.	No. of specimens.	Locality.
11	The Lagger Falcon	Falco juggur	1	Hyderabad.
23	The Shikra	Astur badius	1	Kotree.
76	The Spotted Owlet	Carine brama	1	Sehwan.
89	The Indian Sand Martin.	Cotyle sinensis.........	1	Sehwan.
123	The Indian Roller	Coracias indica........	1	Jacobabad.
129	The White-breasted Kingfisher.	Halcyon smyrnensis .	1	Jempeer.
136	The Pied Kingfisher ...	Ceryle rudis............	1	Sehwan.
148	The Rose-ringed Paroquet.	Palæornis torquatus. .	1	Shikarpoor.
182	The Pale golden-backed Woodpecker.	Bachypternus dilutus	2	Kotree.
212	The Pied-crested Cuckoo.	Coccystes melanoleucos.	1	Kurrachee.
254	The European Hoopoe.	Upupa epops	1	Kotree.
256	The Indian Grey Shrike.	Lanius lahtora	1	Kurrachee.
257	The Rufous-backed Shrike.	Lanius erythronotus. .	1	Kotree.
260	The Bay-backed Shrike.	Lanius hardwickii ...	1	Kurrachee.
262	The Pale Brown Shrike.	Lanius arenarius	1	Sehwan.
265	The Common Wood Shrike.	Tephrodornis pondicerianus.	2	Sehwan.

Jerdon's No.	English name.	Scientific name.	No. of specimens.	Locality.
			1	Hyderabad.
278	The King Crow	Buchanga atra.........	1	Kurrachee.
432	The Bengal Babbler ...	Malacocircus terricolor.	1	Kurrachee.
436	The large Grey Babbler.	Malacocercus malcolmi.	1	Sehwan.
438	The Striated Bush Babbler.	Chatarrhoea caudata.	1	Kotree.
480	The Brown-backed Indian Robin.	Thamnobia cambayensis.	1	Sehwan.
481	The White-winged Black Robin.	Pratincola caprata ...	2	Kotree.
483	The Indian Bushchat ...	Pratincola indica	2	Sehwan.
489	The Pied Stone Chat ...	Saxicola picata	2	Hyderabad.
491	The Red-tailed Wheater.	Saxicola kingi	1	Kurr.
492	The Black-throated Wheater.	Saxicola deserti	1	Kotree.
497	The Indian Redstart ...	Ruticilla rufiventris..	1	Sukkur.
514	The Indian Blue-throat.	Cyanecula suecica ...	1	Kotree.
660 *bis*	The Brown-necked Raven.	Corvus umbrinus......	1	Larkhana.
674	The Common Indian Magpie.	Dendrocitta rufa	1	Kotree.
681	The Common Starling...	Sturnus vulgaris	1	Sehwan.
686	The Southern Dusky Myna.	Acridotheres fuscus.	2	Kotree.
690	The Rose-colored Starling.	Pastor roseus	2	Jempeer.
694	The Common Weaver-Bird.	Ploceus baya	1	Kotree.
695	The Striated Weaver Bird.	Ploceus manyar	1	Hyderabad.
703	The Plain brown Munia.	Munia malabarica ...	2	Kurrachee.
706	The House Sparrow ...	Passer domesticus ..	1	Kotree.
721	The Black-headed Bunting.	Euspiza melanocephala.	2	Hyderabad.
756	The Red-winged Bush Lark.	Mirafra erythroptera.	1	Kotree.
794	The Little Brown Dove.	Turtur cambayensis .	1	Kotree.
799	The large Sand Grouse.	Pterocles arenarius...	1	Jempeer.
818	The Black Partridge ...	Francolinus vulgaris .	1	Jempeer.
822	The Grey Partridge ...	Ortygornis ponticerianus.	1	Jempeer.
829	The large Grey Quail...	Coturnix communis...	2	Jempeer.
849	The Indian Ringed Plover.	Ægialitis dubia	1	Sukkur.
852	The Black-sided Lapwing.	Chittusia gregaria ...	1	Narra.
856	The Yellow wattled Lapwing.	Sarciophorus bilobus.	2	Mulleer.
872	The Jack Snipe	Gallinago gallinula ...	2	Kotree.
884	The Common Sandpiper.	Tringoides hypoleucos.	1	Kurrachee.
901	The Pheasant-tailed Jacana.	Hydrophasianus chirurgus.	1	Munchur.
903	The Bald Coot	Fulica atra	1	Munchur.
904	The Water-cock	Gallicrex cinereus ...	1	Sehwan.
907	The White-breasted Water hen.	Erythra phoenicura.	1	Fukkeer-ka-Gote.
952	The Whistling Teal......	Dendrocygna javanica.	2	Kotree.
957	The Shoveller	Spatula clypeata......	1	Munchur.
965	The Blue-winged Teal..	Querquedula circia ...	1	Jempeer.
995	The Indian Skimmer ...	Rhynchops albicollis.	1	Hyderabad.

LIST OF SOUTHERN INDIAN AND OTHER PLANTS.

Presented by James A. Murray.

	Locality.
Anaphalis neilgherriensis	Neilgherry Hills.
,, notoniana	,,
Budlea discolor	,,
Centranthera humifusa	Wynaad.
Sophubia sp.	Poolachee.
Alsycarpus longifolius	Bermuda.
Desmodium congestum	Annamallays.
,, latifolium	,,
,, recurvatum	,,
,, diffusum	Jubbulpoor.
,, gangeticum	Madras.
,, triquetrum	Moulmein.
,, gyrans	Rangoon.
Lonicera Leschenaulti	Ootacamund.
Viburnum capitellatum	Coonoor.
Pothos scandens	,,
Gomphostemma Heyneanus	Anamallays.
Dicerma biarticulatum	Neilgherry Hills.
,, pulchellum	,,
Zornea sp.	Madras.
Sesbania Ægyptiaca	St. Thome.
Tephrosia hirta	Venkatagherry.
,, purpurea	Neilgherries.
,, suberosa	Juggiapet.
Atylosia neilgherriensis	Neilgherry Hills.
Jonesia asoca	Condapilly Hills.
Acacia pulchella	Ootacamund.
,, robusta	,,
,, verticillata	,,
,, dodonæfolia	,,
,, longifolia	Neilgherry Hills.
Gnetum funiculare	,,
Genista lutea	,,
Clerodendron infortunatum	,,
Cinnamomum ovalifolium	,,
Indigofera linifolia	,,
Cajanus Indicus	Madras.
Indigofera cordifolia	Neilgherry Hills.
,, pentaphylla	,,
Crotalaria Wallichiana	,,
,, rubiginosa	,,
,, anthylloides	Waltair.

	Locality.
Crotalaria barbata	Neilgherry Hills.
Gomphocarpus fruticosus	Madras.
Cressa Indica	,,
Olea robusta	Neilgherry Hills.
Ilex wightiana	,,
Melaleuca leucodendron	Madras.
Tetranthera ligustrum	Neilgherry Hills.
Litsaia ceylanica	,,
Gyrocarpus odorata	,,
Laurus cinnamomum	Ankapelly.
Hamelia patens	Madras.
Pentas carnea	,,
Galium asperifolium	Neilgherry Hills.
Rubia cordifolia	,,
Hymenidictyon obovatum	,,
Mussænda frondosa	,,
Knoxia corymbosa	,,
Pavetta brunonis	Coimbatoor.
Ixora parviflora	Madras.
,, coccinea	,,
Ixora rosea	Madras.
Eugenia Arnottiana	Neilgherry Hills.
,, Jambolanum	Madras.
Eucalyptus perfoliata	Neilgherry Hills.
Valeriana brunoniana	,,
Ærua javanica	Madras.
Hydrocotyle rotundifolia	Ootacamund.
Goughia neilgherriensis	Annamallays.
Macrea oblongifolia	,,
Neurocalyx Hookeriana	Wynaad.
Ophiorrhiza munghos	Annamallays.

Total 73—species.

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PROCEEDINGS OF THE SOCIETY DURING THE QUARTER.

The usual monthly meeting of this Society took place on Monday, the 4th October, and was largely attended. Dr. D. Macdonald presided.

The following new members were elected:—Mr. R. Roberts, Mrs. John Jardine, Mr. Jamsetjee C. Jamsetjee, Mr. Cawasjee Day Limjee, nad Mr. D. D. Opiumwala.

Mr. H. M. Phipson, the Honorary Secretary, then read the following list of contributions received since last meeting :—

Contribution.	Descriptions.	Contributor.
1 Monkey-mouthed Shark...	Stegostoma tigrinum	Mr. E. H. Aitken.
1 Wart Hog's Skull	From Somali Coast	Capt. W. Avis.
1 Koodoo's Head	Do. do.	Do.
1 Armadillo's Skin............	Do. do.	Do.
1 Tortoise Shell	Do. do.	Do.
1 Gazelle (alive)	Do. do.	Do.
A quantity of Snakes	Do. do.	Do.
A quantity of Fish.........	From Aden	Do.
2 Bats	From Mahim	Mr. C. Anding.
A quantity of Sea Shells and Birds' Nests.	Do.	Mr. Jas. Mason.
1 Large Horned Owl (alive).	From Lanowli	Mr. S. J. Sarjant.
Nest and Eggs	Prinia Stewartii	Mr. R. Wroughton.
1 Duck (alive)	From Alibag	Mr. W. F. Sinclair, C.S.
A quantity of Fish, Crustaceans and Marine Animals.	Do.	Do.
1 Chameleon (alive)	Chamelio vulgaris............	Mr. H. Barrett.
1 Snake	Dipsas gokool..................	Mr. F. Kirby.
2 Lizards	Sitana Pondiceriana	Mr. H. M. Phipson.
1 Long-tailed Forest Squirrel	Sciurus Macrourus from Ceylon.	Mr. G. H. Hampton.
1 Ostrich	....	Victoria Gardens.
3 Snakes	From Saugor, C. P.	Mr. H. E. Barnes.
1 Bustard.........................	From Malegaon................	Mr. H. Anderson.

MINOR CONTRIBUTIONS.

From Miss Johnstone, Mr. Daley, Mr. R. Roberts, Dr. Weir, Captain E. F. Becher, and Mrs. A. K. Oliver.

CONTRIBUTIONS TO THE LIBRARY.

" Annals and Magazine of National History " (No. CV.), by Mr. H. Littledale; " Catalogue of Birds in Lucknow Museum," by Mr. G. Reid; " Proceedings of the Linnean Society of N. S. Wales (Vol. I.); and " Catalogue of the Library of N.S. Wales."

Mr. E. L. Barton exhibited several heads of tiger, panther, and markhor, mounted by him, which were greatly admired.

In an adjoining room, which the Anthropological Society had kindly lent for the occasion, an exhibition was held, showing the different kinds of fruits and vegetables which are obtainable in Bombay at this season of the year. The collection consisted of 175 different varieties.

Mr. H. M. Phipson acknowledged having received the greatest assistance from Dr. Kirtikar, Mr. W. F. Sinclair, and Mr. Nanabhoy F. Davur, in purchasing, arranging, and naming the specimens. Many of the exhibits came from private gardens, and a vote of thanks was proposed to the following gentlemen who had sent in specimens for exhibition :—

Mr. Frank Jefferson, the Hon'ble Mr. Justice Birdwood, Mr. Cowasjee M. Dadabhoy, Mr. Sorabjee D. Dubash, Mr. Nanabhoy F. Davur, Mr. Kaikabad D. Ghandy, Mr. P. B. Brunton, Dr. Weir, Mr. J. Anderson, Mr. N. S. Symons, and the Superintendent of the Victoria Gardens.

Dr. Kirtikar then read out a list of the natural orders of the vegetables obtained by the Society from the Crawford Markets, incidentally touching on those sent up by some of the members of the Society individually. He briefly explained the uses of some of the vegetables and fruits. Beginning with the grass-order, Dr. Kirtikar said, there was a very well-developed stalk of Jowari or Sorghum vulgare, exhibited by the Hon'ble Mr. Justice Birdwood, which showed to what height it could grow under favourable circumstances. It went up as high as 12 feet before it threw out the ear of corn. Side by side with the Jowari plant was a beautiful specimen of sugarcane (Saccharum officinarum), grown on the "Kutchra" ground of the Municipality. Dr. Kirtikar dwelt on the importance of using "made ground" for cultivation purposes, the decaying animal and vegetable matter from which, he said, afforded much nutritive matter to plants, at the same time serving as an effectual method of the disposal of refuse matter. Vegetation, he hoped, thus carried on would remove some of the offensive odours which have been the characteristic of the Byculla Flats. There was one special kind of vegetable belonging to the grass-order which he said was entirely unknown to many. It was the tender off-shoots of the Bamboo (bambusa arundinacea) known among the Hindus as *vasota*, which made very good pickle with the juice of sour limes, and common salt. He must not omit, he said to mention that there were a few rice-bearing stalks of the Oryza sativa, which formed the staple food of the Hindus of the Konkan and Deccan. He next described the uses of lemon grass, known as *ola chah*, "green tea," or Andropogon citratum, used principally by the Parsees for flavouring their tea. Oil is also manufactured from it. He next described the uses of some of the Arads available now, such as the Amorphophullus campanulatus (Sooran) and Colocasia antiquorum (aloo), the acridity of which was removed by the use of garlic and ginger, and by boiling in salt and water before making up the dish. Touching the Natural Order Musaceæ he remarked that though there were several specimens of plantains in the day's collection, it was not a season for plantains. There was one remark, however, he wanted to make, he said, regarding a special variety of the plantain which came from the village of Agashi in Bassein Taluka. This variety of plantain was the only one that could be dried in the sun for preservation. The plantain, he said, was peeled and dipped in honey and exposed to the sun for seven or fifteen days. It was an industry which was confined to Agashi only. Several attempts were made in the surrounding villages to improve the trade by growing this special variety of plantain, but the results had not produced plantains worth preserving. Why this should be, Dr. Kirtikar observed, was a problem to botanists to solve. Referring to the Borassus flabelli-formis (fan-leafed palm), he remarked that the fruit was very tender and delicate eating, a great favorite among children. The water it contained was delicious and refreshing. Regarding the Areca catechu (supari) and Piper betel (pan), he observed they made the usual dessert of the Hindu after his meal, and formed the *vida* when eaten with a little catechu, chunam, a few grains of cardamoms, some cloves, a bit of nutmeg or mace. Among the Anacardiacæ were the Kajoo and Charoli, both used dry, the latter for adorning Burfi, made by boiling milk with sugar over a gentle fire, and thickening it, and the former for sweetmeats and curries. There was a specimen of mango from Bangalore—smellless and perhaps tasteless; steam communications had rendered it available now. In former years one could not imagine getting a mango in these days. Among the Euphorbiaceæ there were the Cicca disticha and Phyllanthus emblica, the latter of which was very largely used in Poona for making an excellent preserve. Among the Solanceæ were the Loveapple and

Brinjal, both very delicious vegetables. There was the Carica papaya, two varieties of the fruit of which were exhibited, one growing as usual from the tree bearing female flowers only, and the other growing on a plant bearing both male and female flowers. The former was readily distinguished from the latter by its short and thick peduncle or pedicel, the fruit growing from the later having a long curved and slender peduncle, and several flowers on it, the peduncle often branching and giving off other fruit-bearing flowers. The papaya is largely used now as a digestive agent, and makes good pickles. The ripe fruit is also good. The Umbelliferæ were represented by the Carrot (Dauous carota), Parsley and Celery. There was also the green needle-shape leaved tender plant grown from Anethum sowa, which goes among the Hindus under the name of *Shepu*, and is used as greens. Coming to the natural order Cucurbitaceæ, he said it was *the plant* of the season giving some of the finest and most delicious dishes a vegetarian could command. A specimen of Tricosanthes palmata (Kaundal) was exhibited by a member alongside of the edible vegetables, but it was bitter and used for poisoning cattle. It was beautifully red when ripe, but utterly useless except medicinally or as poison. Among the Leguminosæ, he said, there were many which supplied abundant vegetables; the Dolichos Lablab (Papdi) was good in curries, the Dolichos sinensis (Chowli) was very pleasant and delicate eating. Everybody knew the pea. The peculiar four-angled, fringed pod of Chowdhar when cooked in thin slices with butter, salt, and pepper afforded an agreeble tender dish. The tamarind supplied the place of vinegar in Hindu household economy. On account of the lateness of the hour it was impossible to enter into the details of the several other orders. But he hoped that on some future occasion he would be able complete his observations and supply a few notes on the economic aspect of the various fruits and vegetables growing and procurable in and around Bombay.

The usual monthly meeting of this Society was held on Monday, the 1st November, and was largely attended.

The following new members were elected:—Messrs. F. D. Parker, H. W. Barrow, Charles Taylor, A. W. Morris, Alexander Descubes, W. M. Daly, S. Hornidge, E. Litchfield, W. C. Taylor, H. J. Hemming, and E. L. Luard.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions to the Society's collections:—

Contribution.	Description.	Contributor.
A quantity of Fish, Lizards and Bats.	From Carwar....................	Mr. H. S. Wise.
A quantity of Insects	Do.	Do.
1 Sarus Crane	Alive	Mr. H. Barrett.
A quantity of Shells	From Mauritius................	Mr. Alex. Descubes.
1 Snake..............................	Typhlops brahminus.........	Do.
68 Birds' Skins	From Sind	Col. Swinhoe.
A large collection of Butterflies and Moths.	From Bombay	Mr. Fraser Hore.
Skin of Red-bellied Flying Squirrel.	Pteromys magnificus	Major G. Poole.
Skin of Grey Flying Squirrel.	Pteromys fimbriatus.........	Do.
Skin of Leopard Cat	Felis Bengalensis	Do.
1 Bear's Skull	Ursus labiatus	Mr. E. L. Barton.
1 Australian Red Parrot ...	Alive	Mrs. M. C. Turner.
1 Monkey Mouthed Shark...	Stegostoma tigrinum	Mr. W. F. Sinclair, C.S.
1 Eel.................................	Sp. Muræna	Do.
A quantity of Coralines ...	From Alibag	Do.
A number of the new Species of Balanophora.	From Mahableshwar	Mr. W. E. Hart.

MINOR CONTRIBUTIONS.

From Mr. W. W. Squire, Mr. H. Sinwald, Mr. R. N. Mant, Mr. James Conroy, Mr. F. L. Maguire, Mr. H. Hatch, Mr. M. C. Turner, Colonel Walcott, Mr. R. Gilbert, Mr. P. R. Wilson and Dr. Weir.

CONTRIBUTIONS TO THE LIBRARY.

"Bulletin of the American Museum of Natural History, New York," in exchange; "Annals and Magazine of Natural History" (No. CVI.), H. Littledale; and "Journal of the Asiatic Society of Bengal" (Nos. I., II., III.), in exchange.

EXHIBITS.

Tigers' skins, with four unborn cubs, and two panthers' skins, Mr. Sarjant; one head and skin of doe antelope, with horns, 22½ inches in length, His Highness the Maharaja of Jodhpore; and one wild Buffalo's head, mounted by Mr. E. L. Barton, and shot by Mr. J. D. Inverarity.

The Honorary Secretary announced that H. H. the Maharaja of Rutlam had sent a donation of Rs. 50 to the Society.

Owing to the indisposition of Dr. D. Macdonald his paper on Cobra-bites was postponed.

Mr. J. H. Steel (Bombay Veterinary College) then read the following paper, illustrating his remarks with diagrams and spirit specimens :—

I wish to introduce to you this evening a number of zoological characters who have a more or less bad reputation, and, because they love darkness rather than light, are presumed to be workers of evil. Whether the bad name these organisms have received, and the aversion with which they are looked on by their fellow-animals, men, is just or no, will be explained in the sequel, let it for the present be remembered that doubtless parasites from their own particular point of view are highly respectable characters. As even the study of criminal tribes and outcastes has a value and much interest, and the pursuit of such specimens of humanity is not pleasant except for the zest of the chase and love of danger, which most men experience more or less, so the shikar of parasites of higher animals is at first not pleasant; but when employed in this way soon one forgets any offensiveness of surroundings and feels keenly somewhat as does the foxhunter while the covert is being drawn, or the *shikaree* when the beaters are at work. And this research has high value, for, strange as it may seem to some of you, these small inhabitants of our bodies are more dangerous foes to the lives of higher animals than are even the tiger or the cobra. For very numerous and fatal diseases are due to parasites; thus the rot of sheep, which often ruins sheep-farmers, is due to "Flukes" in the liver; the "Pip," which carries off poultry, depends on worms in the windpipe; and the Trichina, which mankind obtain from pork, and which often kills the human being unfortunate enough to obtain it, is a small round worm barely visible to the naked eye.

"We really know *less* of the habits of internal parasites than of the formidable "denizens of the jungle," whereas common sense and policy would suggest to us to know *more* with a view to their avoidance and extirpation, as they are our more bitter foes. I wish to direct your attention to the way in which these creatures "live, move, and have their being," and with a view to introducing the subject have selected what to parasites is a geographical region, the equine organism or system of the horse. It is, as concerns our internal parasites, not a very favourite country as compared with the canine organism or the bovine organism, and yet it is fairly well frequented, and the inhabitants are of various castes and manners. The country is a fairly hot one, and very uniform in temperature, the thermometer constantly standing at about 100° F., with a range of not more than a couple of degrees. A moist country, moreover, in most parts, but not without fairly dry spots, which are sometimes frequented. The air varies very much in different parts. On the large canal known as the alimentary, it consists principally of carbonated and sulphuretted hydrogen. In the passage known as the respiratory it is beautifully fresh, but very moist, and with a genial warmth about it. Fortunately for the inhabitants of this geographical region, they can utilize the oxygen contained in the surrounding fluids by absorbing it through the skin surface; they, therefore, are not concerned as to whether their atmosphere is good or bad, and having neither lungs nor bronchi do not dread either asthma or pneumonia. This is rather fortunate for them as, we shall shortly see, they are apt to be abruptly turned out into the cold.

A wonderfully disturbed region is the alimentary canal above-mentioned, sometimes narrow, sometimes expanding into broads, and always agitated by a peculiar churning motion most aggravating to a parasite, were it not that it is thereby saved the trouble of going far to seek food. One can hold fast in such a place by means of anchors and pincers, as received through the beneficent foresight of Providence, and in ease and luxury collect the beautifully prepared morsels which are brought to our mouths by the constant movement of our canal home in ever fresh supplies. We can adopt the tactics of the oyster, but our food is better prepared than his, and we do not need even the lazy motion of arms to grasp it, or the waving to and fro of nets to catch. A jovial life the inhabitant of the alimentary canal leads until in an unguarded moment he happens to let go his hold; then he is pushed from his broad residence through numerous narrows probably filled with food offensive to his palate, and at last is by cruel fate expelled even from the equine organism, and left to do as best he can when suddenly exposed to the terrible influence of a temperature of but 60° F. Happy is the worm who before becoming the victim of so tragic a fate has made provision for the future of his race, and can die happy in the assurance that his ova will resist those influences to which he has succumbed, and that, in due course, his progeny will enter the region he has lost and carry on his life's works! Let us take some few of the inhabitants of the equine organism, and see what manner of beings they are. The alimentary canal of the horse has on its course a large pouch called the stomach, in which we are almost sure of a "find," in India especially. On cutting open this pouch we note its lining membrane to be of two parts, one quite white, the other reddish white. On the former part we shall probably find what the uninitiated would call maggots, but what are commonly called "Bots"; on the latter part we shall very likely see innumerable small thread-like worms really of two kinds called "great mouths" and "little mouths" (spiroptera), and probably some "abodes" which they have made for themselves. (1) The Bots are maggots of the Gad fly, that is they are the young of certain winged insects for which Nature has found a most comfortable abode in which they may develope. When they wish they can hold on by two black prickle-like hooks which they have at one end, and when they want to move on they can do so after the manner of worms, joint by joint, gaining a grip on the surface over which they are travelling. As the part of the mucous membrane to which they are attached is very smooth, each joint has on it numerous horny spines which give a good grip. These bots are not harmless to the horse. A few cause him little inconvenience, but many may even cause his death. I have known cases where they were sufficiently numerous to cause a blocking up of the passage from the stomach into the bowel. Recently I treated unsuccessfully a pony which had an abscess in the loins, caused by bots which had pierced the walls of the stomach. In other cases severe indigestion is caused. If in the autumn or early spring your horse falls away in condition, eats earth or whitewash, or likes to lick anything cool; if he frequently straightens the head out and turns the upper lip inside out, and is "foul" (to use a term well-known to horsemen), he probably suffers from "worms," not improbably bots. Now it is one thing to put medicine down a horse's throat and into his stomach, but quite another thing to get the worm to take his share of the dose, so bots are often difficult to get rid of; however, it is possible to make them very uncomfortable for a few days by giving the horse doses of turps, salt, or green vitriol, and when this has made them thoroughly discontented with their surroundings, clearing them out by a dose of aloes. Bots are representatives of what are termed "partial parasites." Their residence in the horse lasts very much longer than the other phases of their life. Whenever by accident or in the course of their life's work, they pass from the body and fall to the ground they wriggle into grass or loose soil, and become Chrysalides, and in due course the gadfly escapes. It is a most pertinacious insect, which deposits its eggs on the long hair of the legs of horses. The eggs adhere by a kind of glue which seems somewhat acrid in its character, for the horse constantly bites and licks the part on which the eggs are attached. His warm saliva loosens the gummy substance, and the eggs (or larvæ) are carried into the mouth and in due course down to the stomach, where the young bot escapes as soon as convenient by lifting up an operculum or lid at one end of the shell. A few bots give little if any trouble.

2. The Spiroptera, "great mouths" and "little mouths," are extremely frequent in this country, but not often seen in England. They are Nematodes or round worms, and of considerable importance to owners of horses. The "little mouths" live free in the cavity of the stomach over the soft part of the mucous membrane, which they cause to become thick and congested, and covered with a very thick vcisid mucus, worms and mucus together forming a wriggling, seething mass. A harness horse which I owned some four years ago, was a victim to these small tormenters. Feed him as we would, we could get no flesh on his bones, nay rather he continued to fall away, although he used to eat voraciously and with depraved appetite. He showed a peculiar crankiness of humour, so that at times no amount of persuasion would cause him to go. Finally he was destroyed, and the soft part of his stomach was found to be quite concealed by myriads of these small round worms.

The "large mouths" construct themselves residences in the stomach, which have been formed into "abodes" or "nests"; these are abscesses in the wall of the stomach, practically between the mucous and muscular coats which become matted together as a result of inflammation and form a single or divided cavity in which is much pus, and which opens by one or more "mouths" into the cavity of the stomach. The "large mouths" seen to live on pus, the small mouths on mucous and perhaps stomach contents. In a considerable proportion of horses opened in India there are found gastric abscesses, or the remains of the "cysts," as caused by the great-mouthed round worm. Sometimes the cysts are of enormous size, and it may be easily understood what an amount of pain must have been caused in the formation of these abscesses, and that many an obscure case of colic or indigestion may be traced to this cause. Proper care in cleansing the food of horses is an important means of prevention of invasion by these parasites, a liberal salt ration with the feed, and occasional doses of worm medicines will prove beneficial. The pus-eating "great mouths" in their cysts are the most difficult to get at; cases of rupture of the stomach, which are not an infrequent occurrence among horses in India, are often due to the weakening of the coats of that organ as caused by this parasite.

3. The large headed ascaris (*A. megalocephala*) is an enormous white round worm, found generally in the small intestine, sometimes in the stomach His importance as causing disease is in no way proportioned to his size. He probably gets into the stomach simply by making a journey of exploration from the intestine. The male is smaller than his spouse, and decidedly of second-rate importance in the domestic circle, a very common feature among entozoa. When the syce lugubriously brings one of these worms in the morning and urges that his horse wants medicine, no apprehension should be excited in the owner's mind, but the horse will be the better for a course of iron tonics. Yet these worms, though some of the largest, are among the least formidable to which horses are liable. Only when they are present in very large numbers do they cause mischief, and then purely in a mechanical way, by blocking up the bowel; the wild ass recently examined by me had over one hundred in him. They are rather rare among stabled horses in India.

4. No part of the alimentary canal of the horse has a richer fauna than the cæcum and commencement of the colon. Three species are specially frequent there; among them we will first of all notice a blood-sucking parasite, which, though small in size, does much mischief. He can't be mistaken; like a British infantryman he is known by his red colour. His looks betray him, and enable us at once to distinguish between him and the armed strongyle of which we shall speak directly. He is armed with four spines (*Str. tetracanthus*), which enable him to "tap" the small blood vessels of the bowel when he is thirsty, a small red spot indicating where he has been carrying on his operations. His development is shown to us in a very remarkable manner. If you examine the mucous membrane of the cæcum you will find it dropsical and pulpy, as a result of irritation caused by these worms, and if you peel it off and hold it up to the light, you will find the offenders in many cases in enormous numbers, simply curled up in the substance of the membrane, some scarcely visible with the naked eye others almost as large as the adults. They were first described as "Trichina-like" organisms. These blood-suckers cause fatal diarrhœa in colts, and may be considered among the most formidable to which the horse is liable; fortunately adult stabled horses do not much suffer from them. In one outbreak over one hundred ponies are reported to have died from this cause.

5. With these last are liable to be confounded the "palisade" or wandering armed worms which occur in their adult form, especially in the cæcum and colon: they are larger and stiffer than the blood-suckers, and have a black line instead of a red one running up through them; this is because they feed on the dark contents of the bowel. They are, therefore, much less troublesome as adults than their red companions. Their principal importance arises from their adventurous youth, during which they wander strangely. Sometimes the young strongyles are seen in the eye, but another species is much more frequent there, as we shall see directly. An armed strongyle may turn up in almost any part of the body, but is extremely frequent in the arteries of the bowels, where he gives rise to disease (aneurism). You can seldom open the body of an old ass without finding in his bowel-arteries either young armed strongyles, or traces that they have been there, depending on the time of year. These aneurisms are considered a frequent source of colic in the horse, at any rate

they must cause the animal considerable pain, and interfere with proper nutrition, especially of the bowels. The young strongyles are able to travel about, in consequence of the boring apparatus on their heads, but generally prefer a much easier method of progression. They bore into the blood vessels, and are carried by the blood current to different parts of the body, and so we can easily understand how they may turn up anywhere. The very young and the adult worms live in the alimentary canal of the horse; the latter escape from the bowel and discharge eggs which are hatched by natural influences, and the young escape into the soil, and enter the bodies of small snails, where they reside comfortably until the snails are swallowed with food by the horse. They then escape into the stomach and intestines, and bore their way through the walls of the alimentary canal. The adults can be expelled and killed by "worm medicines," especially santonin.

6. The "wandering eel-like worms" (*Filaria papillosa*) must not be mistaken for armed strongyles. We seldom open a horse in this country without finding wriggling about in the warm moist cavity of the abdomen one or more long white worms, the males with corkscrew tails, but smaller than the females. But one of the most familiar appearances of these creatures in an immature form is in the eye of the horse, occasionally of the ox. The eel-like worm of the eye of the horse can be seen quite plainly at first disporting himself in this natural aquarium, but very soon he gives rise to so much irritation as to cause complete clouding over of the eye and often permanent loss of sight. A surgical operation for removal of the worm has to be resorted to, and very frequently proves quite effectual. The parasite is much more frequent in low-lying marshy districts than in others, and in India notably occurs in Lower Bengal. It is remarkable that worm in the eye is practically never seen in England, and therefore its treatment is a speciality of Indian Veterinary Surgery. In other respects this worm is known to cause serious inflammation of the organs of the abdomen.

The England "Flukes" or flat worms (*Fasciola hepatica*), like those which cause rot in sheep, are not uncommon as cause of diseased liver in horses and asses. In India this species seems rare, but a near ally, the Amphistome, is very common and rather important. On opening the cæcum and colon we not unfrequently find enormous numbers of small reddish bodies, like grains of barley, mixed with the bowel contents. These on examination prove to have a sucker at each end of the body, which used to be mistaken for mouths, hence their "mouth at both ends." They cause a good deal of irritation, and in their effects resemble and are nearly as serious as the blood-sucking strongyle, than which they in India are more frequent. Liberal salt ration is the best preventative of them, and, indeed, a measure to which all horse owners in this country should constantly resort, care being taken that the horse, not his syce, obtains the benefit of the salt. These amphistomes like other flukes are remarkable for the complex and numerous developmental stages through which they pass. At one time swimming freely in tank water in all the glory of a long tail, at another ignominiously encysted in the body of snail, finally settling down not uncomfortably to a fat living, enjoying *otium cum dignitate* in the cæcum or colon of the horse. There are many animals that have a much worse time of it than a fluke! Individual flukes, unlike strongyles, contain both male and female organs.

8. Tapeworms are not frequent in the adult form in vegetable feeders, although among the principal parasite torments of flesh-eaters and man. Yet we do see small tæniæ in the large bowel of the horse; in so far as my experience goes, very rarely

in India. They are so short and peculiar in appearance as to be hardly recognizable as tapeworms. They give rise in some cases to severe irritation in the bowels. What is the source of the most frequent tapeworm of the horse is not known, but our knowledge of the development of other Tapeworms gives us some clue.

9. Thus the horse like other herbivora (but not nearly so frequently as the ox and camel) has often in his liver and lungs, what are known as Hydatids or Hydatid cysts. These look like white tumours, sometimes bigger than a cricket ball, in other cases no bigger than a pea. When cut into liquid contents squirt out with force often into the eyes of the enthusiastic student of Zoology. These contents are watery for the most part, but have little white grains in them which, examined under a low power, are found to be tapeworm heads; the tumours, in fact, are the cystic or bladder stage of development of the tænia which, more than mankind, deserves Shakespeare's description, a one individual "in its time playing many parts," its acts being seven ages—

1. First the "Ovum" with its shell expelled into the world,
2. And next the "sixhooked embryo" wandering free,
3. Then boring through the tissues of the host becomes a "Cyst,"
4. Which nurse-like from its inner coat developes young,
5. The "Scolices," on heads which bear a ring of hooks
6. Hydatids swallowed by flesh-feeders lose their coats, but many heads
7. Develope into fruitful Tapeworms and each segment bears ova in many thousands to preserve the race.

I have never known a horse die from Hydatids, but cattle suffer much from them.

10. The sharp tails (Oxyurides) must for the present complete our imperfect enumeration of equine parasitic organisms. They are probably the most familiar, because they reside in the terminal portion of the alimentary canal and are expelled often in enormous numbers. Almost every horse brought in from the districts has some of these worms. They are feeders on excrement, cause little mischief, and can easily be recognised by their having a round firm body, and a soft tail-half to it. They are something like a thick whip with lash as stout almost as and not longer than the handle. Although not very serious they cause irritation, and many a tail spoiled by rubbing is due to the presence of these worms. One of the most common and distinctive indications of their presence is a brownish white deposit around the posterior outlet of the alimentary canal, and sometimes a specimen will be found to have become entangled in its passage through the opening. Syces bring specimens with great triumph as proof of the necessity for a native worm medicine of considerable value, Palas papra seeds. The best treatment, however, for the form of parasitic organism is Injectio Terebinthinæ. The larvæ of Oxyurides hatch out in the earth, then enter some animal in which they become changed into the hermaphrodite form. Those of Ascarides and Filariæ lie encapsuled in some animal, and with it pass into the digestive system of some other animal-form in which they become adult; those of Strongyles live in the earth, and assume the adult condition in some animal (Von Linstow). Such are some of the remarkable variations in metamorphoses shown by Nematodes.

I trust my brief sketch has established my position that internal parasites are worth studying by the naturalist, to whom nothing should be common or unclean!

THE usual monthly meeting of this Society took place on Monday, Dec. 6th, Dr. D. Macdonald presiding.

The following new members were elected:—Mr. Proctor Sims, Mr. R. D. Hare, Mr. A. Conroy, Mr. J. S. Ashby, Mr. C. Sykes, Major Elliston, and Mr. H. Gonne.

Mr. H. M. Phipson, the Honorary Secretary, then read the following list of contributions, received since the last meeting:—

Contributions.	Description.	Contributor.
20 Birds' Skins	Collected at Simla for the Society.	Capt. W. R. L. Anderson.
A quantity of Insects	From Belgaum	Mr. H. E. Andrews.
Lizards and Snakes	From Cutch	Mr. A. Newnham.
1 Civet Cat	Vivera malaccensis	Mr. Thos. Lidbetter.
1 Bronze Winged Jacana.	Parra indica	Major Lyons.
An Herbarium (containing 180 specimens.)	Bombay Flora	Mrs. Succaram Arjoon.
1 Black Buck's head	From Hurda, C. P.	Mr. Alfred Walker.
1 Chinkara's Head	Do.	Do.
4 Snakes	From Moulmein	Mr. M. C. Turner.
2 Skulls	......	Mr. M. H. Nazar.
A 4-legged Chicken	From Shahabad	Mr. A. Witt.
7 Snakes	From the Punjab	Major Yerbury, R. A.
14 Lizards	Do.	Do.
1 Civet Cat (alive)	Vivera megaspila	Capt. W. H. Walker.
Teeth of Sperm Whale.	......	Do.
A Collection of Moths and Butterflies.	Types	Col. Swinhoe.
Skin of Red Cat Bear.	From Nepaul	Mr. Chester Macnaghten.
1 Porcupine Fish	......	Mr. E. M. Slater.
2 Black Bucks' Heads	......	Do.
1 Chameleon (alive)	Chamæleo vulgari	Capt. F. B. Peile.
1 Large Bee's Comb	From Govt. Dockyard	Mr. W. J. Killen.
1 Fresh Water Tortoise (alive).	......	Miss Langley.
1 Snake	Simotes Russellii	Mr. John O'Connell.
2 Lesser Civet Cats (alive.)	Vivera malaccensis	Mr. T. W. Cuffe.
Blind Fish from the Caves of Adelsburgh.	Proteus anguinus	Dr. H. J. C. Godfrey.
Several Birds' Skins	......	Mr. J. D. Inverarity.
Nest of Loten's Sun Bird.	C. lotenius	Mr. E. H. Aitken.

MINOR CONTRIBUTIONS.

From Colonel Portman, Captain L. Herbert, Mr. C. W. L. Jackson, Mr. Burwan Jayram, Dr. Temperley Grey, Mr. C. R. Brendon, Mr. E. C. Crawley, Mr. G. B. Reid, C.S., Mr. M. C. Turner, Mr. J. Wallace, Mr. W. R. Hamilton, and Mr. F. D. Parker.

EXHIBITS.

"A long-tailed Japanese Cock" with a tail measuring 8 feet 9 inches, Mr. F. D. Parker; "A Lion's Skin" (shot in Kattiawar), Captain W. P. Kennedy; "Two Ovis Poli Heads" (from Yarkand), Mr. R. A. Sterndale.

CONTRIBUTIONS TO THE LIBRARY.

"Flora of British India" (Hooker) Part XIII., from the Government of Bombay; "Portraits of the Game Wild Animals of S. Africa" (Harris), Mr. Dhunjeebhoy H. Wadia; "Butterflies of India" (Marshall and de Niceville), Vol. II., purchased; "Indian Silk Culture" (T. Wardle), from the author; "Glossary of Vernacular Names of Drugs" from Dr. Dymock; "Zoological Society of London," Reports, 1883-4-5 from the R. Z. S. of London; "Geological Survey of India Record," Vol. XIX., part 4, from the Registrar.

Mr. R. A. Sterndale exhibited two splendid Heads of the Ovis Polii which had been sent to him for sale at Rs. 200 each. Mr. Sterndale dwelt upon the rarity of this giant sheep, which inhabits the loftly snow-clad mountains north of Kashgar and Yarkand. No English sportsman had, he said, ever succeeded in shooting one of these animals, and it was consequently of the greatest importance that the Society should, if possible, secure one of these heads for its collection, as such an opportunity might not occur again.

A feeling of regret was generally felt that the funds at the disposal of the Committee were not sufficient to enable them to purchase either of the heads.

Dr. D. Macdonald then read the following paper on

Cobra Bites.

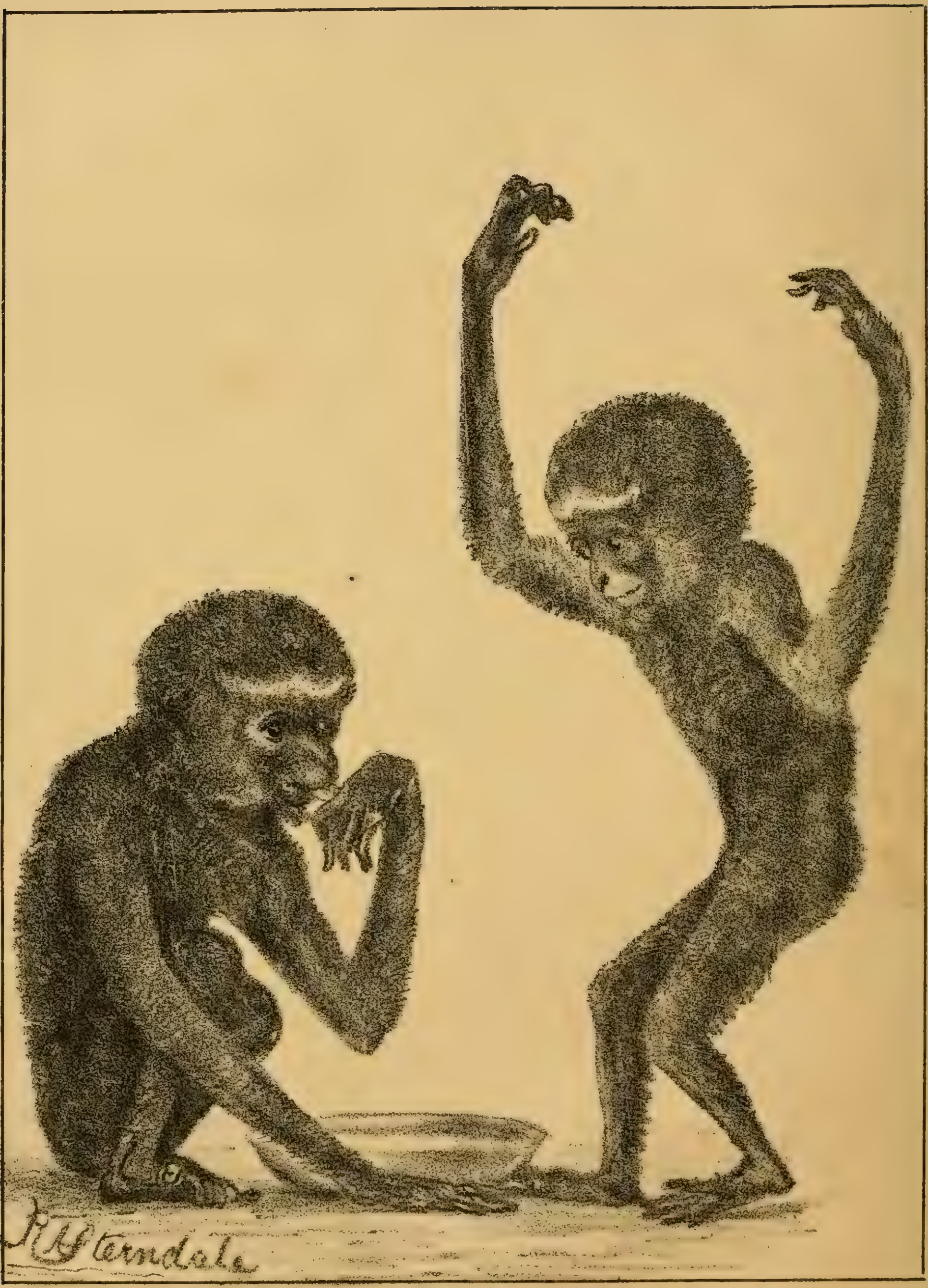
Members of the Society may have noticed more than two months ago in the daily newspapers the announcement that the stuffer at the V. and A. Museum had been bitten by a tame cobra, and that he died in consequence of the bite. As there are some points of scientific as well as public interest, I have thought it advisable to bring the case before the Society.

The snake was purchased for the Museum six weeks before the unfortunate accident took place. As usual the fangs were extracted, and in order to make the snake if possible more completely harmless, part of the poison duct was cut out as well. There are three principal parts in the poison apparatus of a cobra—(1) the gland which secretes the poison; (2) the perforated fang, which pierces the body of the bitten animal, and at the same time permits the poison to pass along its canal, into the wound made by the fang; and (3) the duct along which the poison passes from the gland to the hollow tooth.

As may be seen in the illustrations here there are several reserve fangs, very small, varying in size, lying loose in the surrounding flesh, and in a loose capsule. Each of these, one after the other, moves forward to take the place of the perfect fang, when that becomes broken or injured, and becomes firmly united to the maxillary bone. Some months are required for the full development of these extraordinary or supplementary teeth, but whenever one of these moves forward to take the place of an injured or extracted tooth, it is capable, as soon as it can penetrate the skin of any animal, of inflicting a wound as poisonous as that inflicted by the full grown fang; for, the gland which secretes the poison is first as active as ever. In the special case referred to, the stuffer took the cobra from the hands of the skinner, who had fed the snake with milk; but, against all rule, incautiously seized the animal with the hand unguarded. It must have been held loosely, for the snake managed to wriggle round a little, and got one of the new fangs, which was still very minute, into a fold of the skin of the forefinger. The stuffer called out for pincers, and some delay took place. At last the assistant took a quill and simply pushed the small tooth out, and the cobra was then restored to its cage. The stuffer at first made light of the bite, but some carbolic acid was put on the puncture, and he was at once sent to the J. J. Hospital. The well-known symptoms of snake-poisoning were already showing themselves, and active measures were at once taken to counteract the effect of the poison. Too high praise cannot be given to the house-surgeon who continued during the whole of the night to keep up artificial respiration; and next morning there was marked improvement, which went on until all signs of snake poison completely disappeared. In speaking of the first night's experience the stuffer afterwards related how he was able to see, hear, and feel perfectly, although quite incapable of speech or movement. Every one began to feel certain that the stuffer was going to make a good recovery: and when it is remembered that every symptom of snake-poisoning had disappeared, it must be admitted that there was good cause for this opinion. Unfortunately, on the third day fever set in, and also inflammation of the lungs, and the stuffer slowly sank under these and died on the fifth day, in spite of everything that skilled medical aid and constant and faithful attendance and nursing could do.

As to the temporary recovery from the actual effects of the poison, it will be evident that the amount of poison must have been less than in an ordinary bite. Indeed, remembering that the ducts had been partly excised, it may surprise any one that poison entered the wound at all. But this is accounted for by the fact that, although the duct was partly excised, the gland is still active, and the poison which it secretes can make its way from the duct into the mouth, were it mixes with the saliva, and becomes diluted. In the case of the stuffer the small fang was kept in the wound in the fold of skin for some minutes, during which the poisoned saliva could act on the punctured wound. Had the snake been removed at once, my impression is that very little, if any, poison could have entered the wound, and certainly not enough to do any serious injury; but as the snake was kept in this position for some minutes, with the muscles compressing the gland, and forcing the poison into the mouth, it is not difficult to account for the poison which entered the wound, and, through it, the system.

And here an important question arises. One of the daily newspapers in referring to this unfortunate case, expressing its disapproval of poisonous snakes being kept in the V. and A. Museum, saying that any one might see any day, in the streets, the same reptiles rendered safe and harmless. The writer either did not know, or did not understand, that the snakes were believed to be harmless: that not only were the same measures adopted which are taken by the snake-charmers to render harmless the cobras exhibited in the public streets, but an additional safeguard was adopted in excising part of the ducts. And the question I refer to is—are the snakes exhibited in the streets perfectly harmless? I do not think they are. Nothing save the complete removal of the glands which secrete the poison can render a poisonous snake harmless. It is true, that the perforate tooth, the hypodermic syringe, as it is termed by Mr. Aitken in the chapter on the *Hypodermatikosyringophoroi* in his "*Tribes on my Frontier*," is not there; but, as the poison is still secreted, and as it must make its way through the duct or fistula into the mouth, a bite with even the ordinary teeth, may be dangerous. I believe that such a bite has resulted in death, and there are cases on record in which death has taken place after such a bite. Since the unfortunate accident occurred at the Museum we have given up altogether the practice of keeping live cobras, and I should advise every one who sets some value on life to give cobras a very wide berth, no matter how positively it may be asserted that any particular specimen has been rendered harmless. You may see from these drawings how difficult a matter it would be to deprive a cobra of its poison glands. They lie deep in the tissue at the side of the head, covered over by the muscles which, by their contraction, compress the glands, and thus squirt the poison in the gland through the duct, and along the perforation of the tooth, into the wound, just at the moment when the animal strikes. Even without the perforated teeth, there is still the poison gland, and although the poison, by mixing with saliva, is less powerful than when undiluted, it is still there, and with all its dreaded power to destroy life.



Young Gibbons (Hylobates hoolook) from Assam, drinking and walking. They walk erect, and drink by dipping the back of the hand into the liquid and then sucking off the moisture.

R. A. S.

JOURNAL

OF THE

BOMBAY

Natural History Society.

No. 2.] BOMBAY, APRIL 1887. [Vol. II.

WATERS OF WESTERN INDIA.

PART III.—THE KONKAN AND COAST.

(By a Member of the Society.)

WE now come to the aquatic invertebrates, creatures not only in themselves difficult to examine and describe; but as yet not dealt with in any handy local text-book.* The following notes, therefore, will not be very scientific:—

To begin with the Mollusca, or "shell-fishes" and their allies; we find at their head the Cephalopoda; Nautili, Cuttle-fishes and Squids; the most of which have no visible shell at all; and only one has a real shell.

This is the Pearly Nautilus, the sole survivor of an enormous number of "shelled cuttle-fish" having 4 gills, numerous rather short arms, and no ink-bag.

I never got but one specimen here; a dead shell very much the worse for wear, which may have been hove overboard from some ship.

Next, for convenience, I shall take the so-called "Paper Nautilus." This was the Nautilus of the ancients; but we now distinguish it as "Argonauta."

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* My friend Mr. Murray is engaged upon a Monograph of our crustacea, to appear in his Periodical, which is badly wanted.

The animal has an ink-bag, eight arms and only two gills. The female only has a shell; and this, looked upon as a shell, is a fraud; being really no shell at all, but a sort of nest that she makes to hold her eggs in. It is true that she begins early; young female Argonauts themselves leave the egg with the beginning of a shell about them; much as the human female nurses a doll before she gets out of the nursery herself.

The male has no shell at all; and is a common looking little "octopus," not a quarter the size of the female.

I got one "shell" of the "Paper Nautilus" at Alibag, which had been taken in a drift net with the animal in it; but the latter had "dropped out" according to the captor. This was probably true; there is no muscular connection between the animal and shell (as there is in all true shells); and there was no more reason why the Argonaut should not leave the shell in the fisherman's hands, and do very well without (until, as she probably would, she had secreted a new one) than there is against a hen bird's leaving her nest. This shell is in our Museum.

The rest of the eight-armed cuttle-fishes, ugly creatures, live, on this coast, mostly about the reefs. Out of water they can only crawl; but when the weight of the blob-like body is taken off the arms by the water, they pass over the bottom with what can best be described as a rapid striding motion of arm after arm, or drive themselves stern foremost by spurting water out of their "funnel," at the same time closing the arms together, and letting them stream behind, so that the whole creature looks like some sort of tadpole, or big-headed vertebrate fish, and not a bit like one's idea of a "cuttle-fish."

Some of them have a sort of membranous fins (but I have not got any of these here), and all have an internal rudimentary shell, usually in two pieces, very small and rather hard to find.

The next group is that of the Decapod cuttle-fishes and squills, all of which, besides the eight arms allowed to the Octopods, have two "tentacles" considerably exceeding the arms. Of these we have several species of *Sepia* and *Loligo*.

The Sepia, or true cuttle-fish, lives chiefly near the shore, but in pretty deep water. I never saw one caught between tide-marks here. He comes, too, much more off the bottom than the Octopus; and can swim head foremost upon occasion, by means of fins extending along the whole of each side, though he prefers travelling backwards. These fins, and the muscles that move them, derive some support from the so-called cuttle-bone, which is really an internal shell consisting of a leaf-shaped spongy mass with a very hard sharp curved point at the rear end.

The cuttle-bone, though you can crush it between your finger and thumb, has considerable durability. It survives all the rest of the cuttle-fish, except his beak, in the stomachs of large fish and Cetaceans; and must often pass through these, or, in case of cuttles dying a natural death, remain after the flesh has been eaten by small marine scavengers of one sort or another. At any rate, it is a common object of the sea-shore here; and is used in native medicine as an astringent, with what effect I don't know. In old European practice it was a known antacid, whence the name of the commonest European species, *Sepia officinalis*; and also, in a powdered state, was "pounce," which was used to dry writing before blotting paper came into fashion, and to some extent, I believe, in metallurgy.

The next division of Decapods is that of Calamaries or Squids (*Loligo*), distinguished from the cuttles by containing a rudimentary shell (sometimes two or three of them) in the form of a thin horny transparent blade, commonly known as a "sea-pen."

The fins are rather caudal than lateral; and the squids make better head-way than any of their kin; though they, too, seem to prefer travelling backwards as a rule. They are much the most active of the order, some of them can jump out of the water, and are known to sailors as sea-arrows (the tail fins present something the figure of an arrow-head).

All the Calamaries prefer deep water, and the surface of it, though they are by no means helpless at the bottom. They are common on this coast.

Indeed, there is hardly any sea where you will not find octopods, cuttles, and squids, eating, and being eaten by, most other marine creatures; including the marine variety of *Homo Sapiens*. We have here none of the class capable of catching a man alive; the largest cuttle bones I have got were not 13 inches long, and I never found any squid of these parts exceed 3½ feet (including the tentacles), nor are any monsters of the class reported by the native fishermen here.

But the *Enoploteuthis* of the South seas is said to reach 6 feet long of head and body alone, and *Architeuthis* of the North Atlantic is "certainly known to attain a length of 15 feet or upwards to the body and head; and from 30 to 40 feet or more in the long tentacles." That is to say, this amiable creature is as big as a small boat, and has a spread of yard-arm that would do credit to a good-sized ship.

It was lucky for Victor Hugo's hero "Gilliatt" that he only fell in with a "*pieuvre*," and not with an architeuthis, the more so as most of these large squids are pretty well provided with sharp hooked claws.

Some fossil Cephalopods were as long as a man (or more) in the body, but these were probably Tetrabranchiate; and (so far as we have any means of guessing) inferior in activity and in length of arm.

On the other side of the question, men certainly eat most sorts of squids, cuttles, and octopods; and I can myself vouch for some of them being fairly good eating. The ink should be got rid of before cooking. I remember once getting, in Italy, a dish of small octopods, which would have been very good, if at every stroke of the fork the ink had not spurted out, till the whole mess looked as if the sauce had been made of blacking.

Pretty nearly every sea fish eats every cephalopod he can catch; and gulls sometimes capture squids on the surface. The Marathas call cuttles "Mákuli," squids "Sit-Makuli," and octopods "Au-Mákuli."

The Konkan coast, with its basaltic reefs and muddy water, is not so rich in shells as might be expected of a tropic shore, and the best that I can do here is simply to indicate those that I have observed, following Woodward's classification as closely as possible.

Every beach seems to vary; and there are many Konkan shells in our Museum that I have not collected here; but, writing in the jungles, I cannot refer to the catalogue.* We have few native Strombidæ, the chief is *Rostellaria curta*.

My next shell is a *Murex*, closely resembling the English *M. erinaceus;* and called by children "Aswália" or "Bear-shell." These children's names are rather useful, as grown up natives hereabouts have but few names for shells. A big univalve is Kubá, and a little one Kubi; and bivalves in general are "Shipi," or some derivative thereof. I have also got other *Murices,* and a *Fusus* (probably *F. colus*), *a Pyrula,* and others unidentified.

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* For instance, the pretty blushing *Hemristoma* seems to be abundant just north of Bombay; and is often brought into the city in road material, but I have never got it in, or south of the harbour.

Of Buccinidæ we have a good many handsome sorts *Eburnea* (*spirata* ?), a *Terebra,* species at least, and I think a *Nassa.* Our finest shell is a *Dolium,* as big as a boy's fist, which makes a pretty ornament when the dull brown epidermis has been scrubbed off ; a thing that often happens, to some extent, during the creature's lifetime.

We have, I think, two purples, and I get a great number of dead shells of Olives ; but have never secured a live specimen. They are amongst the prettiest shells we have. Cones are numerous, some of them over two inches long, partly or wholly covered when alive with a bristly epidermis concealing the markings. The little boys call them " Kuttrya " (= dog-shells.)

I have once or twice received Mitres, dead shells, and constantly receive living cowries of three species, the reticulated *Cypræa Arabica,* a larger species spotted " like a pard," and a small species seldom exceeding an inch in length. This shows a great variety of very beautiful spots, speckles, and marblings and colours varying from marble yellow to very deep brown. The specimens, however, when placed side by side show such a gradation that I think they are all of one species. The young are very unlike their elders, little wheat shaped shells, with a long foraminated, turned-up spike at each end.

The money cowry occurs locally on this coast as a dead shell in considerable numbers ; and wherever this happens, you will generally be able to trace it to the wreck of a dhow from Zanzibar. I know two such cowry mines myself.*

I have only got *Natica* and *Lamellaria* as dead shells. A *Potamides* is common in the mangrove swamps ; but perfect specimens are rare ; they seem to get broken at both ends during life. A handsome pied *Nerita* takes the place upon our reefs that the periwinkle does at home, and is, like it, a favourite food of the poor.

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* The little boys call cowries " Dukari " (= pigshell). It is curious that a small shell of the same family is called "piggy" or " pigshell" in the British Isles. Colonel Yule (I think) says that Porcellana" (with the same meaning) is the name of an allied Mediterranean form amongst Sicilian children ; and that probably this gave the languages of Europe their name for *porcelain,* the texture of that material, when first imported, being fairly enough compared to that of the shell. (Porcelain was little or not at all known to the earlier Greeks and Romans.)

I may add, that probably a similar name was applied in France to *some* shell or other, and may be still. It is certain that the earlier French Canadian discoverers called shell wampum " porcelaine."

Along with it are some very pretty little *Navicellæ* of different shades of blue, with white spots.

Among the *Turbinidæ* (top-shells), two species yield "appayas," that is, solid opercula fit for cheap jewellery (studs and so forth). The first is an *Imperator*, much resembling *I*, *imperialis*, a little grey pyramidal shell warted upon every whorl, and nacreous (mother-o'-pearly) throughout, except the grey outer skin (epidermis).

The operculum, or valve, which closes the mouth of the shell, is also "mother-o'-pearly," and looks, in fact, like a little pearl, purple or violet-edged, and in shape like one-half of a tiny split bean. The largest of these opercula does not exceed $\frac{1}{4}$ of an inch in length.

The second species is, I think, a *Monodonta*, closely allied to *M. labio*. It is a good-sized shell, nearly as large, in the finest specimens, as a billiard-ball, covered outside with an olive green epidermis, handsomely mottled with a darker green and with a deep crimson. The whole structure of the shell is nacreous; but the operculum is porcellanous (which is rather curious, but is the case with some other *Turbinidæ*). It (the operculum) is about $\frac{5}{8}$ of an inch across in the largest specimens; and much of the shape of half a split pea. The colouring is green or Spanish brown, or both; with shades of white, pink, or pale orange.

This species has long been used in India for buttons, bracelets, and the like, though not very commonly; but I believe that I myself was the first to use the operculum of an *Imperator* for such purposes.

Some species of *Turbo* from the Pacific and South Seas are much more beautiful than ours; and at one time were a good deal worked up in Paris.

In the same family come the handsome pyramidal *Trochi*, generally marked crimson and grey. All the *Turbinidæ* can be stripped of the epidermis by steeping them in dilute acetic acid (or common vinegar), and then show as entirely of mother-o'-pearl.

In the next family (*Haliotidæ*) we find the *Ormer* or Venus's ear, the largest, perhaps, and most beautiful of British shells. One or two small dead shells of a similar species have been brought to me here; but I could not find out where they had been got.

We have here, however, a remarkable member of this family, *viz.* an Ianthina, or Oceanic snail, or "Violet shell." The connection of this creature with the *Ormers* is perhaps a little overstrained. They are rock-creepers. Ianthina, on the contrary, is at home on the surface of deep "blue water"; where it congregates in great fleets, each snail floating in his own inverted shell. I have some doubts as to whether they can sink at all. It is certain that they cannot do so when breeding, as they have then in tow a sort of raft that they make of glutinous air-bubbles, with their eggs hanging underneath it; and there is no means of withdrawing the air from this float. Moreover, the spire of the shell, which would be the upper part if the snail could crawl on the land or on the bottom, is always of a very pale blue, almost white, and the base (or what ought to be the base) is of a deep blue, which coloration, in a marine animal, is good ground for supposing that the light side is the bottom, and the dark side the top, in its regular trim.

When stranded, the Ianthina is perfectly helpless, cannot crawl an inch, and seems to die almost at once. I never could get a stranded one to live. As for catching them alive, to do that one must find out their fine weather quarters, which are probably, as far as we are concerned, on the other side of a good stretch of herring-pond; for the winds that bring us Ianthina fleets are north-westers, occurring from August to September; and the snails must be brought by them from the Arabian Sea. But to be in that sea, N.-W. of Bombay, at that time, they must have got up on the S.-W. gales of May, June, and July from somewhere far to the S.-W., probably the neighbourhood of the Seychelles and north of that. If their head-quarters were much further east we should get them with the early south-westers. I shall have more to say about these winds and currents later on.

We have one *pink* specimen of Ianthina, probably unique, and as probably coloured by disease. I picked it up myself, dead and empty; but its colour cannot well have been the result of weathering. It was perfect, and long before so fragile a shell as Ianthina could bleach upon the "thundering shore" where it was found the waves alone would have smashed it to pieces, to say nothing of frequent traffic. I find it difficult to secure a perfect specimen, except by having a watch kept on the shore (for this and other matters). When it is reported that "blue flower-shells" are coming in, I go or send at the moment of high water to pick them up. Being very light, they are always stranded along the high water mark only; and in an hour after the first of ebb the delicate tissues of the animal are withered; while a little blue stain on the sand often marks the discharge, in the last agony, of a blue fluid, which may perhaps be used for concealment, like the sepia of the cuttle-fishes, by this otherwise defenceless creature. When the surf of the next tide (if a higher one) has passed over the dead shells, it seldom leaves one perfect. Those cast ashore at the top of springs may *be* long enough to bleach; but they always bleach blue-white, the colour of their own paler portions. If, however, there were a pink *species* of *Ianthina,* it would probably have been discovered before this. At any rate, it is a rare and lovely little shell.

The animal of *Ianthina* is remarkably pig-headed. I do not mean to impugn his morals or intelligence; but merely his profile, He is said to live upon some gelatinous things called velellæ and other acalephæ, whereof I shall have more to say further on; and certain it is that although I often find *them* without *him,* I never find *him* without *them.*

Our common limpets resemble those of Europe. I have not here got any of the queer "key-hole limpets," "Bonnet limpets" and cup and saucer shells, *Fissurellidæ* and *Calyptræidæ;* but no doubt they could be found by a collector with more leisure and knowledge, nor have I any of the extraordinary multivalve *Chitons.*

A very small *Dentalium,* or Elephant's tusk shell, is found on the sands in large numbers.

One of the beauties of our shores is a little sea-snail, *Rotella vestiaria,* which (or rather whose shell, as I never got a live one) occurs in countless numbers; sometimes colouring the beach in bands two or three feet wide and many yards long. How many species of *Rotella* there may be I know not; but we have three marked types of colour, *viz.,* an uniform dark crimson, an equally uniform coral pink, and a mottled pattern in which the ground colour runs from crimson to white; and the markings are of various shades of brown. The largest I get are a little bigger than common "pearl" shirt-studs, but some in our museum are double as big.

The land and fresh water univalves are not particularly interesting, and differ little from those of the Deccan; except the *Cremnoconchi* previously noticed; and a prettily-shaped *Auricula* inhabiting salt marshes and the like places, whence it is often washed out to sea and cast on the shore, where it passes for a sea-shell.

The *Dorids,* or sea-slugs, are pretty numerous; and one or two species reach at least three inches long. These large ones seem to haunt pretty deep water, as I get them mostly from fishing-nets worked some way from shore. One reef-species about two inches long is of a deep crimson; another of the same size pale orange; and one which seldom exceeds an inch in length is cream-coloured, with crimson and black markings. As a general rule, however, their colours are rather dull greens and browns.

Of Brachiopods I have got none, except dead single valves of what I suppose to be a *Lingula*; but in true, or Lamellibranch Bivalves, we are well off. The oysters naturally take precedence.

Between the common eatable oyster of these parts and that of the North Atlantic I find two principal differences—(*a*) that the former is a deal less expensive, and (*b*) that, as the University has not yet taken his education in hand, he cares no more for the letter R than Mr. Jorrocks did for "a haitch." He has, however, a calendar of his own, based upon the Hindu Almanack, and usually from the Mirgsál to the Diwali, that is, from about June to October, both inclusive, you will do well to abstain from oysters in these parts, as the fishermen do.

This, however, is not a law of the Medes and Persians. When the monsoon was late, I have been assured by the fishermen that I might safely eat oysters until there was plenty of fresh water in the sea; and have done so, both I and my house, without any ill effects, until well on in June.

It is however necessary to take great care how the oysters are kept. They should be in clean sea water, and this should either be changed at least twice a day, or still better, changed every moment by the natural method, *i.e.*, by sinking the basket or other parcel of oysters in a tideway. They should always be kept "this side up, with care." *This* side is the flat, or slightly concave, external side, *which never shows any white scar*, as the oyster always rests on, and moors by, the other or left valve, convex externally and concave internally, so that it can retain a little water. This is of the highest importance to the oyster, especially if left out of water by the ebb, or removed from it by violence; and an oyster turned wrong side up in a basket or barrel is just as likely to live as a man hung by the heels. This is the secret of oyster packing. But in any case, tropical climates are ill-suited for the transport of marine bivalves, and a good deal of care is necessary whenever that is undertaken, and at the end of it there is always a great deal of risk to the oyster and some to the man who eats him.

On the Coast, *per contra,* the danger of oyster-eating almost always arises from gross carelessness on the part of some one or other. Nobody gets poisoned with oysters at the Clubs, or at the Apollo Bunder, where proper care is taken in the matter. In one case that came under my notice, I myself, and my household, ate safely of a basket of oysters for three days, at almost every meal; and a man who had eaten them there was afterwards "poisoned" with oysters out of that very same basketful, only in the meanwhile they had passed out of my hands.

As for "copper in oysters," supposed to be derived from rocks, it is a fact that the juices of oysters do, at least occasionally, contain a trace of copper, but a dose of copper likely to affect a man would probably be enough to kill a whole keg full of oysters, certainly far more than enough for any number of oysters that the man could hold. If any gentleman doubts this, let him mix a dose of verdigris with the water of an aquarium, and see how long any oyster or any thing else, lives in the poisoned water.

The fact is that nothing is so hateful to shell-fish, and especially to the *Conchifera,* as the oxide of copper; and that is the reason why it is useful on a ship's bottom. Sir Humphry Davy prevented the copper on a ship's bottom from rusting (by a galvanic experiment which need not be described here), and the result was that that ship's bottom immediately became foul; the *Conchifera* and *Barnacles* having no further reason to fear it.

We have several other oysters here; one has the lower valve plaited, making it look something like a bird's foot. This is little eaten. Another small and rare species of the creeks has the valves long, narrow, and rounded like dinner-knife blades, seldom exceeding 1½ inch in length. I have not got here the "Mangrove oyster" (*Dendrostrea*) which "grows on trees." All oysters, or nearly all, will grow upon dead wood. The connection of "oyster poisoning" with Mangroves is a mare's nest.

Of the so-called Pearl-oysters, *Placuna Placenta,* the Window-oyster, is common here; and is still sought after as containing seed-pearls. It seldom produces large pearls; and since it ceased to be used as a substitute for window-glass, its value has fallen off. I once got here a single small fresh valve of the true Pearl-oyster (*Avicula margaritifera*). It must be very rare.

Our Scallops are small and unimportant; and we have, I think, only one small Spondyle, conspicuous by its orange colour; but

I may have classified it wrongly. I have only got loose dead valves of this shell. We have several Arks, usually found as dead shells on the sands, and prettily marked.

We have one very fine sea-mussel, *Mytilus smaragdina,* the Emerald-mussel, which earns its name by the green internal border of its valves. There are larger mussels here and there, but taking the average, it is a handsome species. It is here a shell of the reefs, less gregarious than the European *Mytilus edulis,* and not common enough to be, like it, an important article of human food or bait. We have one specimen in our Museum with a rough pearl in it. This came to me alive from the Alibag reefs.

The true *Modiolœ* are less common, and our basalt rocks are generally too hard for *Lithodomus;* but I have found the latter in large old dead oyster shells.

We have at least two of the *Unionidœ* or fresh-water pearl-mussels, the same, apparently, as in the Deccan. One is rather thin in the shell, and of a pale olive-green externally (*i.e.,* in the epidermis); the other is larger, thick and strong, with a black epidermis, very like the British fresh-water pearl-mussel. I have got no pearls in either here. They are pretty common; and the thin-shelled species, at least, is eaten.

Of the strange and monstrous *Tridacnas,* Woodward gives one of the queerest forms, *Tridacna squamosa,* as from Bombay, on the authority of Chemnitz. I never got it here, nor can my fishermen recognize the figure. (They are usually pretty sharp at that.) A good many animals can be collected in Bombay that were born a long way off, as *we* know, if any body does.

The great *Tridacna* is commonly imported into Bombay from the China seas, as an ornament for gardens, and is said to be used as a font in some Catholic churches. I don't happen to be a Catholic, and do happen to object to making sights of Churches, so I don't know whether this is true or not. The shell is quite big enough to immerse a whole baby, but it belongs to the coral seas.

Cockles we have, a few; but they seem to want the flavour of the North, and are most used in making lime to eat with betelnut.

I have not identified any *Cyprinidœ,* but a better conchologist probably could. We certainly have one at least of the *Veneridœ,* a shell very like *Cytherea Dione,* only locally common. One of this order is rather famous, the *Venus mercenaria* of the Atlantic States, also known as a "clam," and by the Red Indian name of "Quahaug," (pronounced quaw-hog). The best "Wampum," was made of this shell, whence the scientific name, and it is still useful, not as coinage, but as forage.

It may here be observed that the commercial and gastronomic term "clam" does not now admit of scientific classification. *Venus mercenaria,* as just mentioned, is a "clam," and *Mya Arenaria* (quite as different from it as a black buck from a bison) is a "sand-clam," and so forth.

As for "clam-chowder," it is very nice; but I fancy the clam has nearly as much to say to it as the limestone had to the limestone soup in Lever's story.

A "clambake," is a "stupendous and terrible spree," in which you bake everything you can think of along with the clams, eat the other things, drink everything you can think of, and leave the clams to be eaten by any one who has no better to do, bar one or two, just to satisfy your soul. There is nothing on earth so hypocritical as a "clambake," but it is a fine spree for all that, or because of it, the hypocrisy is so very transparent that it does'nt hurt any one's conscience much, and the clambakers go away laughing at each other like Cicero's augurs. I wish some one would introduce clambakes into Bombay.

I am not sure that we have any *Mactras*, though the accommodation is good for *M. Stultorum.*

Of *Tellinidæ,* I think I have got broken valves of *T. planissima* and *diphos*; dead, of course. We have a Razor-fish *(Solen)*, which I cannot distinguish from the British *Solen Siliqua,* except by its inferior size. It is, like the British species, to be got in the sand at low-water of spring tides, and it may be worth saying that the Razor-fishes are equal, as eating, to scallops. Like scallops, they should be cooked. Boiled Razor-fish is good enough, but "*au gratin,*" or "à la Hollandaise," is better; looks like Maccaroni, and is much more to the purpose.

Cultellus politus of the same family is a very pretty shell; common (as a dead shell) on our shores.

Passing over some families not well represented here, we come to the *Pholadidæ,* or boring molluscs, who compel our attention, like dynamiters, by threatening our lives and public buildings, such at least as they can get at, namely, ships and piers, and the like.

The type of the family is the English *Pholas dactylus* or Piddock; and one species of these seas, *Pholas bakeri,* requires a better

Naturalist than I am to distinguish him from the same. The shell is long, oval at one end, and at the other tapering off into a sort of duck-bill shape. The heavy end is covered with toothed ridges, and although, at a glance, the whole shell appears to be one of the most delicate and fragile of the Coast (*the thin parts are translucent*), an attempt to scratch it with a penknife shows that it is of very hard stuff.

To borrow for an instant the special slang of the Mineralogists, most sea-shells are of something like Calcite, but the Piddock and his breed house themselves in Arragonite, a very much harder form of lime. Such a statement, of course, requires to be taken with a good deal of allowance for a "allotropism"; and other Mineralogical and Chemical details that would be out of place here; but in the main it is as true as that horses are shod with wrought iron and "jumpers" with steel. "Jumpers," be it known to any reader that didn't know it before, are tools like crowbars, used for boring holes in stones; and of the same use is the shell of the Pholads.

The "Piddock" himself, though the chief of the family, is not its most active member; piercing chiefly clay and chalk or such comparatively soft substances. He looks, too, like a shell-fish, has the regular two valves of the Conchifera, (there are really five plates, but three are inconspicuous) and nothing very striking about him at first sight, except that fully half of him, the foot, is as transparent as ice. He works like an awkward boy beginning to use boring tools; by half turns right and left; blowing out his sawdust at intervals; if one may use such a word where the respiratory medium is water.

As we proceed with this family, we find, in some, the bivalve shell little more than rudimentary, not covering more than one-twentieth part of the animal. This is the case with the Teredos or ship-worms; so-called because at first sight they look a good deal more like worms than "shell-fish." In others the shell has four or five valves, easily distinguished, and covering the whole, or most, of the animal.

Speaking generally, the long "ship-worms," work *with the grain* of the wood that they attack. They line their tunnels with concrete, and have a sort of miner's law amongst themselves, in virtue whereof they never invade each other's "claims." They usually bore in wood, sometimes in mud. The mud-boring species have been lately sufficiently dealt with by another member of this society, under the name of Kuphus.

The short, completely shell-clad species, *Xylophaga, Martesia,* &c., attack wood, oyster-shells, and stone. They do not line their tunnels, and they have no regulation as to boundaries, boring with or across the grain, cutting each other's lines, and sometimes, to judge by some specimens that I have seen, cutting through each other's shells. It is probable, however, that the shells so cut through were empty.

Both groups are numerously represented here. Native vessels suffer little from them, partly because they are usually teak-built, and well protected with the peculiar compound called "chopan," but still more because they are very frequently beached and any long exposure to the air is unpleasant, not to say fatal, to the Pholads. European vessels are usually either coppered or iron-built, and the ship-worms are therefore not now a terror of the sea. But both the long "worms" and short shell clad borers still play havoc with piles and the like on this Coast.

It is not very long since we had a honey-combed block of wood in our rooms sent in by the Department of Public Works, with an accusation against certain sea-anemones inhabiting the holes. These, however, had certainly been made by at least two Pholads; one a Teredo "stealing by line and level" as already described; the other probably a Martesia; burrowing at his own sweet will, and "jumping the claims" of his brethren and predecessors without remorse or ruth.

Both had abandoned the pile before it came into our hands (having probably eaten all the soft wood in it) and the burrows had been colonized by sea-anemones and crabs.

The most remarkable exploit of the Bombay Pholads was the piercing of wrought-iron pipes at Hog Island, for positive evidence of which I am indebted to the courtesy of another member of this Society. The pipes, containing water at a very high pressure, were served and parcelled with yarn and so forth to protect them from the water, and this covering, probably, first attracted the Pholad, one of the short fully-shelled species, probably a Martesia.

When he had got through the covering he went on with the pipe. The holes were like clean countersunk holes, and were most likely drilled, by a movement similar to that already described as used by the "piddock," but their clean appearance, and the exposure of the grain of the iron, give reason for suspecting that the mollusc *had the aid of an acid*; which, in that case, he must have secreted himself.

Of course, the moment that any hole reduced the thickness of the pipe so far that it could not longer bear the tremendous pressure of the water within, the remaining diaphragm of metal was burst out, and the miner driven out of his own burrow like a shot from a gun, so that, although we have the "*corpus delicti*" plain enough, the *corpus delinquentis* is not likely ever to come to hand (in the case of a finished hole). But an oyster shell in the Society's Museum shows a small Pholad dried in his burrow, who is probably near of kin to the miner of Hog Island. The story is perhaps one of the most remarkable in the modern history of Molluscs; and with it I close my remarks on those of the Konkan.

Having, so far as in me lies, treated of the true Molluscs, I have to deal with the other Invertebrates, under especial difficulties. Very few men, not being professional naturalists, really understand the multitudinous and multiform *canaille* of the waters; and as for books, I am now in a remote jungle, dependent on *one* Nicholson's "Manual of Zoology." I write, therefore, very much subject to correction, and shall have done all I can hope to do, if I happen to help any one who knows less than myself. So far as possible, I shall follow the classification of the standard work noted above; and shall draw on it for some of my facts; as, in respect of the Mollusca, I have depended mostly on Woodward.

Of the higher tunicaries, the Ascidians seem to be rare here; at least I have got very few, and those not remarkable. These are the creatures about whom it passed for a joke, some years ago, to say that "the Darwinians believed themselves to be descended from a marine Ascidian."

The truth of the story is, that a Mr. Kowalefski considered himself to have discovered, in the larvæ of certain Ascidians, structures analogous to those characteristic of vertebrate animals. In this he was supported by other naturalists, and, amongst them, by the late Mr. Darwin, who, moreover, stated that he had, long before Kowalefski's publications, made similar observations on certain Ascidians at the Falkland Islands (where, it may well be supposed, he had not the best laboratory in the world).

The whole matter, as regards the Ascidians, comes fairly within the scope of this paper; but it need hardly be said that I do not propose here to take up such a subject as the doctrine of Evolution. It may fairly be said that many competent naturalists consider the supposed vertebrate affinities of the Ascidian larvæ to be merely superficial; that the adult Ascidians show no trace whatever of such affinity; and that as things now stand, an amateur naturalist may most safely assume the Amphioxus or Lancelet fish of the Mediterranean to be the lowest known vertebrate. I think it possible that the little transparent fish, mentioned at the end of my last paper, will be found to represent the Lancelet here. But I am sure that it will supply no missing link, having bright and distinct eyes, whereas those of Amphioxus are rudimentary, or little better.

I have received and sent in to our Museum a few creatures that I took for Salpœ.

Of the *Polyzoa,* I have sent in several specimens of at least two forms of *Flustra* (Sea-mats, or Sand-corals): these abound on the coast; they are very beautiful, and abominably brittle. Their growth is extremely rapid under favourable circumstances. We have in our Museum one very large specimen. It is (I write under correction, as the thing is very brittle; and goes on diminishing every time it is moved) over 18 inches long, 15 wide, and 8 deep.

This grew on an iron buoy that I scraped and painted (partly with my own hand) and sent to sea at the end of September 1885. The buoy was landed in May 1886, and the men who did that job preserved for me the *Flustra,* which was therefore of under 8 months' growth.

Of the aquatic insects little can be said here. The entomologists justly claim a monopoly of their extremely intricate subject; and any one else touches it at his peril. I have already noted that certain water beetles are food for crocodiles, and every one knows the great water beetles that fly against the lamps of the Byculla Club, and look "as big as sparrows." As I write, a small bright green species lies in heaps, like pebbles, on the banks of a tank before the tents; and for some reason is untouched by the numerous crows and other birds feeding about. Certain beautiful tiger beetles haunt the sands, and a species (apparently) of beetle skims the surface of the sea in calms, like the "water boatmen" (*hotonecta*) of English fresh-waters (which, however is not a beetle). During the height of the South-west monsoon, the life-boats cruising off the coast see coloured butterflies at sea. But whether they come from Africa, or Madagascar, or the Mauritius, no man knows. This much is certain, that they appear very much at home in a whole gale, not at all so helpless as one might imagine; and I know from other observations that in light winds a butterfly can weather on any ordinary sailing-boat, and will do so, going to seaward. What his motive may be I don't pretend to explain. One can hardly credit a butterfly with the ideas of a Columbus.

In Crustacea our waters are rich enough. We have no true lobster (*Homarus*), but the lobster's place and name are taken on our tables by several marine cray fishes. There is a certain confusion about the popular names of the long-tailed crustaceans which I shall try to clear up, so far as may be. A lobster is a long-tailed marine crustacean having claws big enough to be worth eating, a hard, black, calcareous shell, and a long serrated horn on his forehead. A *river* cray-fish (*Astacus*) is a sort of dwarf lobster. His English name is derived from the French (*Ecrevisse*), and he has stood godfather to a lot of *sea* "cray-fishes," which differ in having no claws big enough for the table. Among these are the French Langoustes (which in France are considered better than lobsters, the opposite doctrine obtaining in England) and the "lobbishta" of our butlers. In these the horn, as well as the claws, is absent, or much smaller than in Homaries, and is also apt to be squarer in section.

A prawn is a dwarf lobster, with the regular horn, and sometimes with the broad heavy claw. One of our common species here is a perfect miniature lobster in shape. But the prawn's shell is entirely or mostly horny; and more or less translucent. A shrimp, again, has no horn or claws to speak of. The whole group, however, are very closely connected with each other, and are known to science as "Macrurous Decapod Crustacea," that is, "long-tailed, ten-legged, shelly creatures." The prawns in particular are extremely numerous here, and many of them are very richly coloured, though unluckily the colours do not last in spirit. Most of them, after death (no matter how caused) turn red, or reddish-white. One small marine species appears to be born boiled. We have several fresh water species. A very small one haunts mountain springs with the Alpine carps and loaches. A very fine one is found in all our rivers, and is a source of great annoyance to the angler, unless he is hooked, which is very difficult to manage. However, as the capture of the prawn requires far more skill or luck than that of any vertebrate fish in our waters, and as he is very much superior to these for the table, an angler sometimes gets a good deal of comfort out of him. The prawn swims low, never more than three feet above the bottom, and usually on it. His presence is easily discovered, as he pulls the float to and fro, or round in circles, and finally walks away with it, with a motion easily distinguished from that of any fish. You can get rid of his attentions by shortening up the trace under the float; but if you want to catch him you must use the smallest and toughest bait, such as a bit of sinew, and leave the point of the hook well bare. Such a bait he will probably take into his mouth, after fumbling about it a good deal with his claws, and then a smart stroke will drive a sharp hook through his shell. He will fight for about a minute, and sometimes cuts the line with his claws. A good prawn will measure 9 inches from the tip of the horn to the tip of the tail, whereof 6 inches are good eating, and amount to one good help of lobster. The length of the great claw-bearing legs is the same as that of the animal. The other pairs are short and feeble. The claw-points cross each other when closed, and inflict a nasty little wound. They, and indeed the whole claw-bearing (cheliferous) limbs are somewhat calcareous or crusty and opaque, showing an approach to the lobsters and cray-fishes, but the rest of the shell is horny and translucent.

The *Anomura* (or eccentric-tailed crustaceaus) form a group between the long-tailed lobster tribe and the crabs. The commonest of them here are the Hermit crabs, all closely resembling the European *Pagurus Bernhardus*. The anomaly of their tails is that they are naked; and in fact the whole animal of Pagurus may be likened to a prawn half-shelled. What shell he has, however, is stony and not horny. By way of shelter, the Hermit-crab takes up his quarters in any empty univalve shell that he finds handy, coiling away his naked tail in its spiral chamber, and making fast with a sort of sucker that he has *ad hoc*, so well that you may pull him to pieces easier than make him let go.

The Hermit-crabs are exceedingly numerous here. Their small fry, in thousands, inhabit dead shells of Rotella; and the larger those of whelks and murices, &c. A very favourite shell with them is that of *Potamides*. They give rise to some disputes between me and my collectors, who are led to expect higher prices for shells containing the living animal, and always pretend not to know that the Hermit-crab is other than the proper inhabitant of the shell. Another group of the Anomura are the so-called "crab-lobsters," (*Porcellanæ*) which are not very common here.

The true Crabs are classed as Brachyura (or short-tailed), and invariably carry their tail tucked between their legs; nor is it of any great use to them, except that the females carry their eggs between it and the body. They are extremely numerous and various in our seas and fresh waters. Racing crabs (ocypoda) are not common in extra-tropical countries. The Irish, indeed, have a proverb, "Ye may be a racer, but ye don't look like it; as the Devil said to the crab," which indicates a want of acquaintance with this group. For the ocypods not only *are* racers, but *do* look like it. Another family, the *Gelasimi*, "calling," or "laughing crabs," may be described as large claws with small crabs growing at one end of them. They are numerous wherever a mixture of sand or gravel with mud exists between tide-marks; and in such places you will often see from afar the bank covered with as it were white pebbles, which suddenly disappear as you approach. These are the claws, which are mostly white, with more or less red, black, or blue; and they have retired into their burrows.

Some small burrowing crabs cover many miles of the sands with the "spoil" (engineers call it) from their burrows, made up into neat little pellets, and removed from the holes in a fashion that looks like bead-work, arranged in a pretty vine-leaf pattern. Others only make a rough spoil heap near the burrow, and the work of both is easily mistaken for that of worms.

Then there are spider-crabs, and "peacock-crabs" (*mhor pakhi*), so called from their coloration, with three ocelli like those on a peacock's tail. There are many native names for them, "*kenkad*" is a general one "*Dhaw-more*" (running-crabs) are the *ocypoda* and *gœlasimi*; "*Sawa-more*" are queer grey crabs with feathery legs found in the creeks, but not common. "*Chimbore*" are another estuarine species, and "*Mute*" are land-crabs. The giant of the Crustaceans, *Birgus latro*, the cocoanut-crab, is not found here; and indeed I must confess that all our crabs are wanting in size as compared with those of northern seas. I have some Europe crab-shells in which I get the Indian crab baked; and have arrived at an equation as regards our largest eatable species here, viz., that they are to the British crab exactly as a tailor to a man. They have their seasons, and are not always wholesome; but the natives can generally be trusted to report upon that.*

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* NOTE.—The Land Crabs (Gecarcini) are said to be unwholesome in the hot weather, and other species at the change of the shell. I do not know whether the famous soft-shelled crab of the United States is a separate permanently soft species or not. It is certainly by no means poisonous.

Another group of crustaceans is parasitic upon fish, and very often kills them. The salt-water catfishes are the commonest victims. If they had enough sense to deliver each other, as the monkeys do, they could very easily turn the tables on their tormentors; which are ugly flat white creatures, sometimes as big as a sixpence, or bigger.

The most curious, perhaps, of our crustaceans are the hideous "Mantis-shrimps" (Squilla), which get their name from their peculiar claws, deeply-toothed, but not fitted with nippers, somewhat resembling those of the Mantis insect (the Indian Daddy-long-legs, that *does* say his prayers, chiefly grace before meat). Our largest species (*S. oratorio*) grows to more than a foot long, and appears to be very sluggish. Some that I kept lay all day half concealed amongst stones and weeds, but with the claws free and ready for action; and this may, perhaps, be their method of capturing live prey. It is likely however that, like most crustacea, they live a good deal on carrion. Several smaller species are very active. In one of these the armed claws are absent, and the principal legs end in what look like rudimentary nippers, indicating an approach to the lobster's claws.

I have not got any King-crabs here, but they may very well be here. They are queer-looking round creatures, with thin legs completely concealed beneath them, and a long sharp spine in their tail; and are not, indeed, really crabs at all, but more akin to the fossil trilobites; some naturalists say to the Scorpions.

The last of the crustacea are the barnacles and acorn-shells (*balani*) which no one, to look at them, would take to be crustaceans at all. Almost every one has seen the common ship's barnacle, a little delicate shell, with several valves, attached by a long worm-like stalk to ship's bottoms, or any other floating matter; and nearly every one knows the old story of how these barnacles developed into geese. They are very common here; one species is of a bright orange colour, but loses its complexion in spirit. They don't usually attach themselves to stone, with one curious exception, *viz.*, Pumice stone. And in the matter of wood they prefer what is afloat to piling or other fixed timber.

The Sessile cirripedes (commonly called Acorn-shells), on the other hand, prefer stone and fixed timbers, but are not exclusive. They are sometimes wrongly called limpets, but are easily enough distinguished; little conical hard shells, with a hole in the top, looking like a tiny model of a volcano with its crater. On close examination the cone is seen to consist of several plates, and if the creature be alive there will be seen a second cone inside the crater, which is the "operculum" or door valve. A small white species is very common on rocks between tide marks, and some of the outer reefs have a very fine species, with an extremely massive shell, which grows in great clusters as big as a man's two fists. Individual shells are often an inch and more long; the colour is a dull red or black, which weathers, after death, to pink and white. In this condition the shell looks something like a large flower bud turned to stone; and is very effective in the rockwork of a fernery, or the like. It is occasionally called a "tulip-shell," an appropriate name enough.

We get another species on turtles, which is not calcareous but horny, and looks very much like an old-fashioned great-coat button; the colour is a dirty white. Specimens from the underside of the turtle seem to some extent lighter in colour, perhaps because they are less exposed to light. We have some such specimens in our Museum. They don't do the turtle any harm; living on what they get from the water. Some barnacles are said to attach themselves to Whales and Porpoises, but this I have not seen myself. All of them begin life swimming free, and only settle down as they age.

The Annelides, or leeches and sea-worms, are pretty well-known. Leeches of several sorts exist in our tanks, but are not here a pest as in some other tropical countries.

A *Serpula,* very like one common at home, covers stones on the beach, oyster-shells, and so forth, with long white winding tubes. A large *Terebella* is pretty common on many strands. It collects shells and sticks, and more particularly bits of grass, to make a tube for itself to live in under the sand; and sometimes goes by the name of a "Sea-caddis." The use of the grass seems to be to anchor it in the sand. The whole tube, as it lies half exposed, looks more like the root of some plant than the dwelling of a worm. We have some very long smooth ribbon-like sea worms (which may be Nemertida), and one hairy species, looking very like a hairy caterpillar which takes up its quarters upon floating wreck or the like; but doesn't make itself fast in any way. The "lobworm" and "hairy bait" seem to be much the same as those at home; but they don't often come to hand, because they are not used here as bait, and therefore nobody has any motive for hunting them. I have not got any "Sea-mouse" here.

Of the Nematelmia, the most noticeable is the guinea-worm (*Filaria medinensis*) which is unfortunately very abundant. How it gets into the human body is not yet certainly known, but one consideration points to its getting through the skin. It has been known, though rarely, to attack the horse (and, I have heard, the dog). Now these creatures don't usually take as much care about what they drink as men do; and if drinking water was the usual vehicle of the guinea-worm, they might be expected to suffer much more frequently than men. But on the assumption that the worm gets through the skin, the comparative immunity of dogs and horses, which have much thicker skins than men (and also hair on them) is easily accounted for. European authorities consider that the guinea-worm doesn't appear until more than ten months or a year after it effects a lodgment. The natives, however, say that three months is sometimes enough; and the circumstances of a very bad outbreak in my own camp seemed to point to that period. Probably the time may vary. Dr. Bastian considers the guinea-worm to be only accidentally parasitic, and in that case, particularly, much irregularity in development would be natural enough.

The size of this worm is a good deal exaggerated in conversation; one of 30 inches is a good specimen. Nobody has ever seen a male guineaworm to swear to him; our unwelcome visitors are all "ladies in an interesting condition"; and the young, even if liberated in the tissues by the breaking of their parent in extraction, do not appear to grow. The common belief that they do is due to the frequent presence of several filariæ at one time in the patient, quite independent one of the other. The breaking of the worm, therefore, is by no means such a serious misfortune as people make out. The worst that comes of it is the prolongation of the business; and that, of course, is often quite bad enough. I knew of one case in which the worm was broken, and the greater part of it never extracted at all; but the wound healed over, and the patient suffered no more from it. The young, of course, were all or mostly removed by pressure on the wound.

Amongst the *Echinodermata*, I have not found here any *Holothuridae*, or "sea-cucumbers." Probably we have some, but their great head-quarters are in the Coral seas, whence they go to China under the name of trepang, or Bêche de mer, to be turned into soup.

Feather-stars (*Comatula*) are tolerably abundant, and so are the Brittle starfishes (*Ophiuroids*), but the Asteroids, or fleshy starfishes, don't abound here as they do on British coasts; and the sea urchins don't appear to be equal in size, variety, or number of individuals to those of northern seas. In a tide's work you may get half-a-dozen each of Echini and Asteroids, whereas at home you could fill a basket. I have seen raw sea-urchins eaten in Europe, where they are sometimes called "sea-eggs."

I have already said that we have no coral-reefs; and of corals, commonly so-called, such as Madrepores and Millepores we have but few; and the specimens are seldom large. The largest I have got were dead masses which had drifted some way. Some of these are so cellular that they can actually float; and I have found barnacles on them. Living cup-corals will grow upon floating objects. I have repeatedly found them upon drifted pumice; and once or twice upon driftwood; and I have one specimen in which three or four have grouped themselves on a dead broken stem of an Antipath, with young oysters and Balani.

The Antipathes, or Black corals, are found on some of our reefs. They are long rod-like things, with a blackish horny stem (sclerobase), whence they take their name in trade. But when alive this is covered with what looks like a warty bark, really the colony of zoophytes in which the life of the thing is. Some of ours reach 7 feet long, and are as thick as a drawing pencil; but elsewhere, and especially in the Red Sea, the stem attains an inch in diameter. The living "bark" (cænosarc) is often of very brilliant colour, red or yellow; and a handsome little species in Bombay harbour varies from orange to crimson. Besides these we have little gorgonias, or sea-shrubs, seldom (with us) exceeding a foot in height. One of the handsomest, which is of a deep crimson, rarely gets beyond six inches. Others are sulphur yellow, pink, or white. They keep their colour for some months when dry; but at last the "bark" dries and chips off, leaving only the horny stem, which is extremely durable. We have one very fine specimen from the African coast in this condition, five times as large as any I ever saw here, and even now a pretty object.

These things, while retaining their colour, look very well in a bouquet, a hat, or button-hole; and might be more used in decoration than they are. Sea-anemones (*Actinidæ*) are common on the reefs and on immersed timbers; and queer-looking mud-anemones abound in the deep mud of some of the creeks. Others (with better taste) bury themselves in sea-sand. But none that I have got here were remarkable for beauty of colour. I might except one crimson mud anemone; but its shape and surroundings are so ugly that it is very far from being a lovely object.

In the mud, besides these, we find a rather curious object, looking like an earthworm with a backbone. This on extraction turns out to be a long calcareous rod, of the shape of a buggy whip, usually with the point turned or curled over. The creature sometimes reaches a foot in length, and the diameter of a swan's quill, and is probably related to *Virgularia*. We have many specimens.

The Medusæ, or Blubber fishes, are very common. I cannot myself distinguish those which are genuine from those which are merely stages in the reproduction of other creatures. A good many of them can sting and blister the human skin; and though the injury is not in itself dangerous, the fright and shock to the system of a man or boy suddenly stung in the water by an unseen enemy are sometimes serious. In some cases the sufferer is confused to an extent that puts him in some danger of drowning. A set of flannels is a complete protection. On the Irish coast, I have noticed that those blubbers which are almost colourless are harmless; the offending species have purple marginal spots. Here, *per contra,* the fishermen say that the colourless ones are the stingers, and the spotted innocent.

Another stinging thing is the "Portuguese man-o'-war," which consists of a longish bladder with several "polypites" and long tentacles and other organs hanging down from it, which steady it in the water, and do the fighting, feeding and love-making; in short, they are the boatswain tight and the midshipmite and the crew of the Portuguese man-o'-war. It is often driven ashore in great numbers; the polypites dry up to nothing; and the dry bladder lies on the sands till some one treads on it, and it goes off with a pop, startling if unexpected. Still commoner are the Velellæ, little round rafts with a semi-circular sail, and the crew, as before, hanging on the bottom. The fishermen call both of these "Flowers of the deep sea," from their beauty, delicacy, and pelagic habits.

Sponges of several sorts are not uncommon on the reefs, but none of them are of any size or beauty; and none are of any use for washing oneself with. I sometimes use them for packing delicate specimens in spirit. From the perforations I find in dead oyster shells, I think that a parasitic sponge attacks the oyster, but I hav'n't caught him at it. This vermin would probably be allied to the northern Cliona, which does the same thing at home.

The true Sea-weeds (*Algæ*) are scarce and small here, and most of them not attractive in appearance. Nor do I know of any alga being used on this coast as human food or for manure; or in fact for anything at all. I don't know much about them; and Dr. Kirtikar and Mr. Birdwood have made the submarine flora of these seas their own.

Many years ago, Dr. Carter reported the organism which colours salt red in our Bombay Salt-pans as apparently identical with that which reddens snow in the Alpine and Arctic Regions (*Protococcus Nivalis*). This is now generally considered to be vegetable; though the embryo is free and locomotive.

The hot springs all down the Konkan contain peculiar Algæ, probably allied to those which Dr. Kirtikar found at "Wazrabai." They are most abundant, I think, at Unhere, one march from Nagotna, and not far from Pali. Northerly gales bring a drifting Sargassum with little bladders that look like berries (and are not) like *S. bacciferum*. Like it, too, this species seems to live afloat.

Since I began these papers, Mr. Aitken has added to my list of birds one duck, *Mergus merganser*, from Bombay harbour, which, as he justly observes, is probably its most southern record.

Mr. Inverarity (in accordance with his promise), has added two ducks, the tufted pochard, which I had but doubtfully recorded, and the scaup. This last is probably also a most southern record. The truth is that we shall never know all about our ducks until somebody comes with a punt-gun; and this applies particularly to the more marine species. I got a young duck alive in September, which I think must have been a spot-bill; but before the question could be settled the badger broke loose and ate it up.

Mr. Inverarity also notes the true bittern, the little chestnut bittern, of both of which I *have seen local* specimens, since I began these papers, the black-tailed godwit (of which I find a very doubtful undated note in my copy of "Jerdon" as perhaps shot in Bombay Harbour), and the golden plover, which he has found in the sort of ground where I thought it might be, but in far greater numbers than I should have thought possible.* Clearly it is a regular visitor to the coast. He has also identified one crake; there are probably more remaining for any one who will take them up.

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* I have shot this bird since in the Kundlira Valley, 7th April 1887.

As regards the bald coot, his observation confirms mine, that the want of water is the only thing that keeps it out of any part of the Konkan. Of the three tanks on which Mr. Inverarity saw large flocks, each is the largest sheet of water in its taluka. I have no doubt that the bald coots may breed at Vehar, and probably they do so at Bhiwandi. At Panwell they don't.

As regards the purple coot, the notice is very interesting because, for three or four years previous to the famine, I was very intimate with the Bhiwandi water-works and Vehar lakes. The former, I should add, was then in its present form a new lake, having been greatly improved about 1873-4. Now in those years I never saw a purple coot upon either lake, so they must have been, at best, but rare visitors. Mr. Inverarity's notes appear to begin with the next season; the earliest date he gives is October 1887 (and this not for the present bird); and it will be remembered that the Deccan famine was followed by serious failure of rain in Gujarat, a great country for purple coots. This may have set them wandering south'ard, until some found out Vehar and Bhiwandi, and stayed there. I have, since that, seen this bird at Nagotna, and have noticed it, in Gujarat, to straggle a good deal in May; and as far as the climate goes, there is nothing to hinder it from being here, as it is found as far south as Ceylon.

We shall probably have both the coots breeding on the Tansa lake, if it is only protected.

The tank by the old cantonment at Kalyan has always been a great place for both species of Jacana; and I have no doubt they breed there or thereabouts. The Bronze-winged Jacana apparently breeds at one point near Panwell (on the road to the Kalhe Pass), at Nagotna, and at Ashtami; for you may see young birds there in all years. The woodcock shot near Tanna must have been a "straggler;" but I should think it possible that the woodcock occurs along the crest of the Ghats more frequently than we suppose. I never got one in India myself.

I have, in several places above, alluded to pumice stone as the abode of barnacles, annelides and corals, which may require explanation. The fact is, that two years after the great eruption of Krakatoa, pumice stone began to drift in to the Bombay coast in considerable quantities. It had got to the Seychelles the year before, so probably what we got had first travelled to that neighbourhood on the S.-E. trades or some current; and then turned off with the S.-W. Monsoon of 1885. Our largest pieces were about as big as a boy's head. Those which came to the Seychelles were much larger, and so numerous as to encumber passages on the coast, and cause inconvenience (I was told) to boats.

In 1885, it was also reported from the Maldives, but whether it was then coming in, or was what had drifted and collected in previous years, is not clear. In 1884 it had been seen off the coast of Ceylon in great quantities.

KESWAL.

SOME BIRDS SEEN IN A JOURNEY THROUGH PERSIA.

By G. J. R. RAYMENT, A. V. D.

From Bushire to Shiraz through the Kashgai and Bakhtiari Highlands to Isfahan, by Ali Gudurz, Burujurd and Hamadhan to Sunneh in Kurdistan, thence to Kismanshah.

[As far as possible, Jerdon's nomenclature has been adhered to. Birds not identified with certainty are marked thus (?)]

Gyps fulvus.—Large Tawny Vulture.—Throughout the country. Specially numerous on a small hill, a few miles W. of Kismanshah.

Neophron percnopterus.—White Scavenger Vulture—Distribution much as above, but far rarer.

Gypætus barbatus.—Bearded Vulture, or Lammergeyer—Kashgai Bakhtiari Highlands, Highlands of W. Persia.

Falco sacer.—The Cherrug Falcon. Nihavand near Hamadhan, Western Persia.

Hypotriorchis æsalon.—The Merlin—Kashgai Highlands.

Tinnunculus alaudarius.—The Kestrel—Kamaraj and north to Shiraz, disappearing in higher altitudes of the Kashgai country, and again being observed in descending towards Isfahan; met with, though not often, in W. Persia.

Micronisus badius.—The Shikra—Bushire.

Accipiter nisus.—Kurdistan.

Aquila pennata.—The Dwarf Eagle—W. Persia.

Pandion haliætus.—The Osprey.—Bushire, Daliki,—(Foot of hills near Bushire) once at Gandaman, Bakhtiari Highlands.

Circus Swainsoni.—The Pale Harrier—W. Persia.

Milvus govinda—(*M. Ater* ?) The common Pariah Kite—Between Bushire and Shiraz, Kashgai Hills and W. Persia, but very rare everywhere. Blandford in Eastern Persia considers it *M. ater* not *govinda*.

Athene bactriana. Owlet—near Shiraz, Kashgai Highlands. W. Persia. It has a plaintive little cry, very different to the intolerable screech of *A. brama*.

Hirundo rustica.—Common Swallow—Common throughout the country in summer and autumn, disappearing in the cold weather. Breeding at Kazerun, S. of Shiraz, in June.

Hirundo fluvicola.—The Indian Cliff Swallow ? *H. daurica*)—Konarthuktah, 1800 ft. between Bushire and Shiraz in June. Blanford in Eastern Persia refers to this bird as *H. daurica*.

Chelidon urbica.—The English House Martin—Shiraz and South Kashgai Highlands. Breeding in immense numbers in June. I am not sure that it was not *C. Cashmiriensis*.

Cypselus melba.—The Alpine Swift—Shiraz, Kashgai Highlands, but rare; not seen in cold weather.

Cypselus alba—The European Swift—Very common in Shiraz and its neighbourhood; seen in Kashgai Highlands summer and autumn.

One species of *Caprimulgus* seen in Highlands between Bushire and Shiraz, but not identified, probably *C. Europæus*.

Merops viridis—The common Indian Bee-Eater.—Bushire and N. up to 2000 feet.

M. Ægyptius—The Egyptian Bee-Eater ? (*M. Apiaster*) ?—Common throughout the country in summer and autumn.

Coracias garrula—The European Roller—Hills N. of Bushire, Kashgai Hills, Isfahan, but rare.

Halcyon fuscus—The White Breasted Kingfisher—Daliki and Kazerun, N. of Bushire.

Alcedo ispida—Very like A. Bengalensis. The Common Indian Kingfisher—common on nearly all streams of any size and in the Isfahan gardens.

Ceryle rudis—The Pied Kingfisher—Khana Zunian, 6000 ft., near Shiraz, W. Persia near Kismanshah.

Picus Sancti Johannis—(St. John's Woodpecker)—W. of Isfahan.

Picus viridis—Shiraz, Isfahan.

Upupa epops—The European Hoopoe—Common throughout the country.

Lanius tephronotus—Shiraz. Breeding in June.

Cinclus aquaticus—White-breasted Dipper.—Koshru-Shireen, in Kashgai Highlands, Nargan W. of Isfahan.

Petrocopyphus cyaneus—Blue Rock Thrush—Hills near Shiraz.

Turdus Hodgsoni—Himalayan Missel Thrush? Ardakun in Kashgai Land.

Chatarrhæa caudata—Striated Bush Babbler?—Konarthuktah and Kazerun, between Bushire and Shiraz.

Otocompsa leucotis—The White-eared Crested Bul-bul. Bushire and North as far as Kazerun. Breeding in Bushire in June.

O. galbula—European Oriole—Very common in Isfahan.

Saxicola Ænanthe—The Wheat Ear—Kazerun between Bushire and Shiraz.

Ruticilla phœnicura—The European Redstart—Dashtiarjin, between Bushire and Shiraz, Ardakun in Kashgai Land, W. Persia.

Motacilla personata—Much resembles *M. luzoniensis*. The White-faced Wagtail.—Shiraz, Isfahan, W. Persia.

Motacilla sulphurea—The Grey and Yellow Wagtail—Common W. of Isfahan.

Parus major—The European Tit—Shiraz, Kashgai, and valleys, W. Persia.

Corvus cornix—Hooded Crow—Common everywhere.

Corvus corax—The Raven—Common everywhere.

Corvus frugilegus—The Rook—Ali Gudurz, between Isfahan and Hamadhan.

Pica bactriana—The Magpie—Common all over the Highlands. Shiraz. Very common, Isfahan.

Garrulus atricapillus—Jay—S. of Shiraz.

Fregilus Himalayanus—The Himalayan Chough—Kashgai and Kashgai and Bakhtiari Highlands. Isfahan and W. Persia.

Sturnus vulgaris—The Common Starling.—Common everywhere. W. of Isfahan met with in immense flocks.

Passer Indicus—The Indian House Sparrow.—Common everywhere. I never observed the Mountain Sparrow, so common in Afghanistan.

Carduelis elegans.—The European Goldfinch—Common throughout the country in suitable localities. Breeding in Shiraz in June.

Galerida cristata—The Crested Lark—Shiraz, Lower valleys, Kashgai country, Isfahan, W. Persia.

Certhilauda desertorum—The Desert Lark?—Bushire.

Columba palumbus—The European Cushat—Common in the hills S. of Shiraz and Kashgai country, not seen in W. Persia.

Columba livia—(according to Blanford) The Blue Rock Pigeon—Common everywhere.

Pterocles arenarius—The Large Sand Grouse, common in all suitable localities.

Pterocles alchata—The Pintailed Sand Grouse—Near Hamadhan, in immense flights near Bushire in November.

Pterocles exustus—The Common Sand Grouse—Daliki,near Bushire.

Francolinus vulgaris—The Black Partridge—N. of Bushire, not extending to high altitudes.

Caccabis chukor—The Chukor Partridge—Common on all the higher hills.

Ammoperdix Bonhami—The Seesee Partridge—Met with on lower hills, N. of Bushire, Bukhtiari country, plentiful between Isfahan and Shiraz.

Coturnix communis—The Large Grey Quail—Common throughout the country, in higher altitudes during summer and early autumn.

Houbara Macqueenii—The Houbara Bustard—Bakhtiari country.

Cursorius gallicus—The European Courier Plover—Bushire, Kashgai Valleys. Rare.

Vanellus cristatus—The Crested Lapwing—Common in all suitable localities, more plentiful in winter.

Chetusia leucura—The White-tailed Lapwing—Near Shiraz.

Lobivanellus goensis—The Red-wattled Lapwing—N. of Bushire, Shiraz.

Œdicnemus crepitans—The Stone Plover—Alumabad in W. Persia

Grus cinerea—The Common Crane—W. Persia, S. of Isfahan.

Scolopax rusticola—The Woodcock—W. Persia, S. of Isfahan.

Gallinago scolapacinus—The Common Snipe—Common everywhere in suitable localities in winter. First seen on September 4, W. of Isfahan.

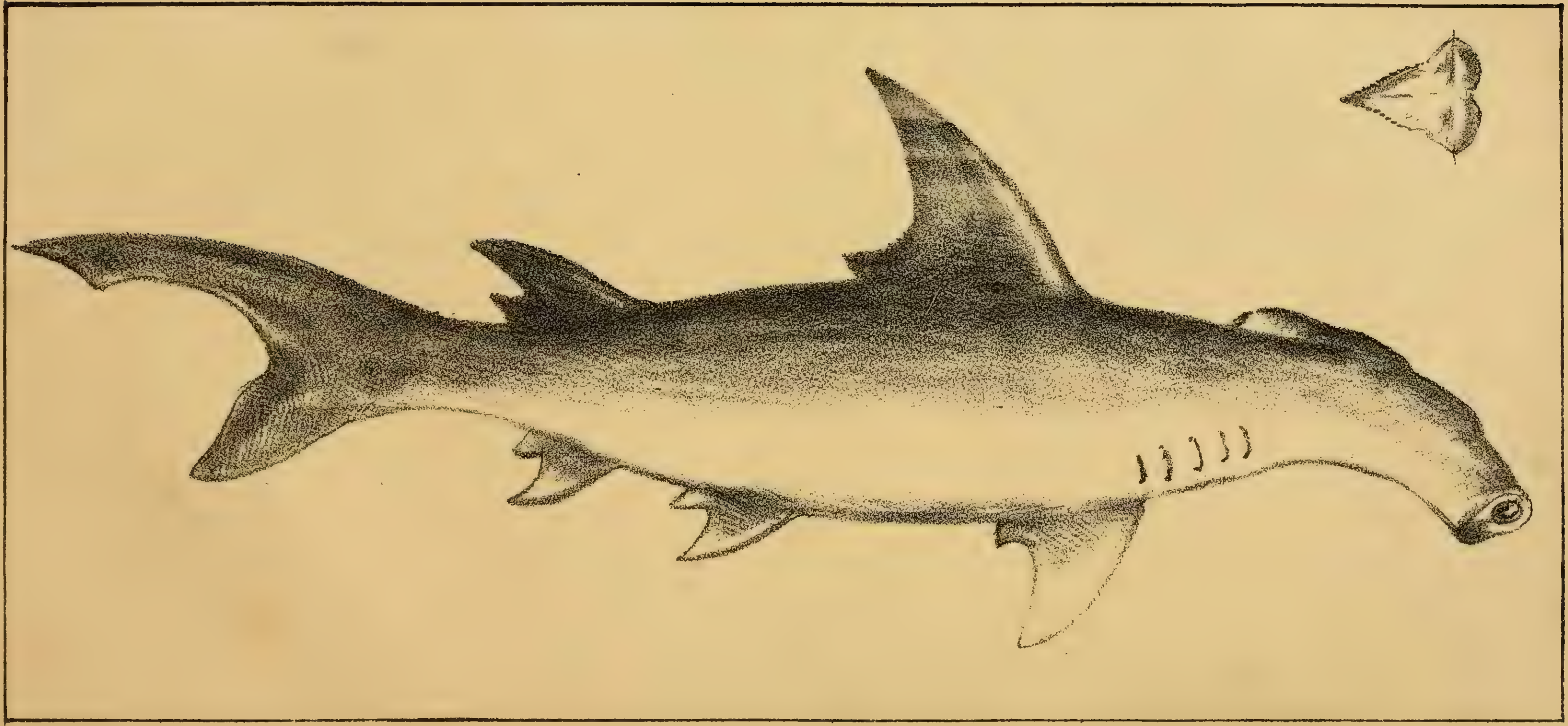
Gallinago gallinula.—The Jack Snipe—W. Persia, Shiraz.

Actitis hypoleucos—The Common Sandpiper—Kashgai country, W. of Isfahan.

Himantopus candidus—The Stilt—S. of Shiraz, W. Persia.

Porphyrio poliocephalus—The Purple Coot—Kazerun Lake S. of Shiraz.

Fulica atra—The Bald Coot—S. of Shiraz. Breeding Bakhtiari, country, June and July.



ZYGÆNA DISSIMILIS (*Murray*) SP. NOV.

Scale $\frac{3}{4}$ inch to One foot

1*a* 4th and larger tooth (lower Jaw) Natural size

Gallinula chlorophus—The Water-Hen—Kazerun, Lake S. of Shiraz. Kashgai country.

Oiconia nigra—The Black Stork ?—Kurdistan.

Ardea purpurea—The Purple Heron—W. Persia.

Herodias garzetta—The Little Egret—Common in suitable localities.

Botauris stellaris—The Bittern—W. Persia.

Nycticorax griseus—The Night Heron—Isfahan and W. Persia.

Phœnicopterus minor—The Lesser Flamingo—One specimen seen at Dashtiarjin, June.

Anser cinereus—The Grey Goose ?—Zargan, N. of Shiraz.

Casarca rutila—The Ruddy Sheldrake. The Chukwa.—Common throughout the country.

Anas boschas—The Mallard—Common throughout the country. Breeding in June and July.

Querquedula crecca—The Common Teal—Common everywhere, late in autumn and winter.

Athya nyroca—The White-eyed Duck ?—Dashtiarjin, S. of Shiraz.

Podiceps cristatus—The Crested Grebe ?—Dashtiarjin.

Podiceps phillippensis.—The Little Grebe—Common everywhere in suitable localities. Breeding in June and July.

Some Pelican seen at Dashtiarjin S. of Shiraz, but not identified.

A NEW SPECIES OF ZYGÆNA, FROM THE KURRACHEE HARBOUR.

By James A. Murray, of the Vict. Nat. Hist. Inst.

ZYGÆNA DISSIMILIS.—*Sp. Nov.*

Anterior edge of head sinuately curved. *No groove running along it.* Length of the hammer from eye to eye 26 inches; from the middle 13 inches. Each of its hind lateral expansions 10 inches; its width near the eye 6·5 inches or less than the length. Eye situated at the upper third of the external edge of the lobe of the head and two inches below the outer edge of the nostril. Teeth very slightly oblique, as broad at base as long, with an indistinct notch laterally and serrated on both edges to near the tip. They are convex before and behind, with an oblong nodose prominence mesially at the base on the outer surface. The 1st dorsal arises from a little more than an inch inside the extreme hind edge of the pectoral fin; it is falcate in shape and measures along the curve to tip, 25 inches; the greatest width to hind prolongation at the base 15·75 inches. Pectoral fin 18 × 12 inches, or one-third longer than broad. Second dorsal arises from opposite the anal; it is triangularly concave behind, and not straight as depicted in the plate of *Zygœna malleus,* Blochu and *Ztudes* in Day's Fishes of India, and has also an elongated process at base. Ventral fin 11 × 10·5 inches, also triangularly concave behind, and not straight as in the *malleus.* Anal fins 7 × 11 inches, concave behind, the distance from its insertion to the tip of the elongate process of the ventral 5 inches. A pit at the root of the caudal, upper caudal lobe falcate, lower proportionately longer than in the other species. Colours brownish grey throughout, except a width of 10 inches on the under surface, where it is white, also the under surface of the hammer.

The following are the measurements of this species taken in the flesh:—

	Feet.	inches.
Total length to tip of upper caudal lobe ...	10	2½
Length of upper caudal lobe	3	1½
„ lower „ „	1	3½
Height of 1st dorsal over curve	2	1
„ „ (vertical) to tip	1	9
Width of „ to tip of elongate process	1	3
Height of 2nd dorsal	0	8
Width of „	0	11
Length of pectoral fin	1	6½
Width „ „	1	0
Length of ventral fin	0	11
Width of „ „	0	10½
Anal fin, length	0	7
„ „ width....................................	0	11

Diameter of eye, 1·25 inches; width of mouth, 9·75 inches.

Hindmost (5th) gill opening smallest.

Locality.—Kurrachee. Captured on 20th April 1884.

This species differs from all the known forms, first, by having its teeth serrated on the edges instead of smooth; and, second, in having no prolonged groove along the entire front margin of the hammer. From *Z. Malleus* by the less curvature of the head and less deep sinuous groove on the anterior edge of the hammer, also by the length of the hind margin of one side of the hammer being more than its greatest width near the eye, and also by the shape and position of the fins, especially the 2nd dorsal and ventral fins, which are concave behind instead of being straight. It is nearest *Z. Mokarran* (Gunther Cat. Fish B. M.), but the length of the hind margin of one of the lateral expansions is greater than the width near the eye, instead of being equal as in that species, and the anterior margin of the hammer does not form a right angle with the lateral lobe.

This makes the third species of Shark lately described from the Kurrachee harbour. The first is *Carcharias Murrayi*, Gunther, the next, *Lamna Guntheri*, Murray, and the present one the third. It is a question now whether these three species extend their range along the Beloochistan and Bombay Coasts.

NOTES ON PLOCEUS PHILIPPINUS.

By Lieut. H. Edwin Barnes.

The normal number of eggs laid by the Common Weaver Bird has been variously stated by different authors; some give two as the correct number, others as many as ten. Dr. Jerdon considered two as the usual number, and was of opinion that when six or more were found, they were the produce of two birds; Mr. Hume, in his *Nest and Eggs of Indian Birds*, page 438, gives his opinion in no uncertain terms. He says:—"With Dr. Jerdon I am perfectly convinced that two is the normal number of the eggs. I have certainly examined over a hundred nests, and *never* found more than three, and only two or three times more than two." This ought to be conclusive. Personally I have never found more than seven eggs in a nest, and this once only, five of them were much incubated, and the remaining two quite fresh; another nest had six, all fresh. With these exceptions, five is the usual number of eggs have met with, but I have also taken nests containing single incubated eggs. This is puzzling, but I believe I have found the key to the mystery; one day, while nesting in Neemuch, Rajpootana, I saw, amongst many others, a remarkably fine nest, which I determined to secure, but as the babool tree, in which it was, stood well out in a pool of water, it was a matter of some difficulty; it contained five incubated eggs, and on searching the other nests on this tree, I found that in each case, when the eggs were incubated, the number was five also, any lesser number proved to be fresh. A few hundred yards away I came upon another colony, and on searching the nests, I found, them to contain from one to five incubated eggs; at the bottom of the tree, lay several good nests, that had evidently been cut down by squirrels, and in some of these I found eggs; here was the clue. Every one must have noticed the numbers of half-finished nests, in every colony, that for some reason or the other have been abandoned; what more likely than, the squirrels having cut down a nest, before the full complement of eggs had been laid in it, the birds should finish laying, either in one of the incompleted nests, to be afterwards completed or not, (I have often found eggs in these half-finished nests), or in one belonging to a neighbour. This theory accounts for a larger and a smaller number of eggs than usual being found in a nest. The squirrels were unable to get at the nests in the Babool tree standing in the water, and in consequence they had complete clutches of eggs in them. I intended watching this tree again during the following season, but having been transferred to Saugor, I could not do so, but soon after the breaking of the monsoon, I found not far from Saugor, a clump of babool trees in a similar situation, and as the bayás had commenced building upon them, I had an excellent opportunity of testing my theory, and later in the season, I found, as I had anticipated that the nests contained five eggs each, in a few cases four only. I am therefore fully persuaded that the normal number of eggs, in Rajputana and the Central Provinces at all events, is four or five, oftener five than four; this I know to be contrary to the generally conceived opinion, but I think that the facts I have adduced, go far to prove the correctness of my views. Mr. Hume, speaking of the nests themselves, says:—The long tubular entrances that the male often goes on building after the female is sitting reaches in one nest I have preserved to a length of 11 inches," and again "as a rule these entrance passages do not exceed six inches in length." A nest that I took at Saugor has the tube 25 inches long, another procured at the same time and place has it 24 inches, and strange to say, the lower portion is incorporated with an unfinished nest, evidently meant to steady it; this fact evinces more intelligence on the part of these birds, ('cute as I know them to be), than I should have given them credit for. Where does instinct end and reason begin? Far better had the birds trusted to instinct alone, for the very means used to steady the nest, gave a snake the opportunity to get in it, for while it was being cut down, one dropped out; and tried to escape in the long grass, but a smart tap on the back with a cane stopped its further career and it proved to be a Brown Tree Snake, (*Dipsas gokool*).

Its stomach contained a partly digested nestling, showing that it had been in the nest for some time, and had evidently meant to stay until its appetite returned, when no doubt it would have dined in due sequence off the remaining three, quite unconcerned and apparently ignorant of the dangerous nature of their self-invited guest. Full measurements of the large nest may not be devoid of interest to both ologists and ornithologists. The length, of the suspensory portion which is very thin, is 19 inches, the bulb 9 inches and the tube 25 inches, giving a total length to the nest of 53 inches. The diameter of the bulb is 6 inches one way and 4 inches the other.

The tube where it joins the bulb has a diameter of barely 2 inches, but it widens considerably at the end, and may be described as bell-mouthed. These nests are of course most of them now in the Bombay Natural History Society's Rooms.

A CATALOGUE OF THE FLORA OF MAHABLESHWAR AND MATHERAN.

By H. M. Birdwood.

"There is a pleasure in the pathless woods."

When offering to the Society the Catalogue of the Flora of Matheran, published at pp. 206-211 of Vol. I. of our Journal, I explained why it was so incomplete. It was compiled at a time of the year when many herbaceous plants were dried up and could not be recognized. I have now been able to enlarge it by adding the names of plants, seen, soon after the close of the last rainy season, at Mahableshwar, where a great part of the Flora is identical with that of Matheran; as might indeed be expected from the general similarity of the soil and climate of the two hills. There are, no doubt, certain causes regulating the distribution of plants which are not equally operative at both places. Mahableshwar is about 70 miles nearer the Equator than Matheran. The latter is an isolated hill, rising from the plain of the Konkan, midway between the Western Gháts and the sea; whereas Mahableshwar is further from the sea, and is, to all intents, a part of the range of Gháts. The highest point of Matheran is about 2,500 feet above the sea-level; whereas the Mahableshwar plateau is at a general elevation of 4,500 feet above the sea, and at Sindola rises to 4,700 feet. These differing conditions are not without their effect. Some plants are found at Mahableshwar which will not thrive on the lower mountain-top. Some Matheran plants, on the other hand, find the higher levels of Mahableshwar beyond their range. I will give here only a few instances. The most casual observer is struck by the wonderful undergrowth of brake-fern at Mahableshwar, and of the arrow-root plant,—which in the months of October and November blooms on almost every square yard of the jungle,—and by the beautiful profusion of the *Osmunda* fern, mixed with brambles and willows, along the upper stream of the Yenna River. At Matheran, the brake-fern is scarcely known. In a few years it will perhaps be extinct; for it cannot defy the onslaughts of thoughtless fern-hunters who take away stray specimens to languish and die in Bombay or Poona gardens. It would be impossible for any number of fern-hunters to destroy it at Mahableshwar. Even if unmolested at Matheran, it drags on at best but a feeble existence. The site is too low for it, the lowest limit of its range in our latitude being probably at a line at least 2,000 feet above the sea level. The *Osmunda* again is not known at Matheran; nor is the willow; nor the arrow-root (*Curcuma caulina*), though other plants of the genus *Curcuma* are plentiful enough. I have certainly seen Mahableshwar raspberries in Matheran gardens; but they were not what raspberries ought to be. Again, there are some well-known Matheran trees, such as the Kumbha (*Careya arborea*), the Malia or Indian Ebony (*Diospyros assimilis*) and the Chandara (*Macaranga Roxburghii*), which do not grow on the Mahableshwar plateau at all. I have been in communication on this particular subject with Dr. T. Cooke, who has made the flora of Mahableshwar and Matheran a special study for many years, and I hope that he will favour the Society with the result of his observations embodied in a "Note" on this Catalogue, and give us lists of the more prominent plants on either hill which are not found on the other. After taking full account of these, it will still be seen that very many of the plants included in the Catalogue are common to the two hills. Such a coincidence is favoured by the similarity of their geological formation and by the circumstance that there is no great difference in the range of their mean temperature at different seasons and in their rainfall. Both Mahableshwar and Matheran are, roughly speaking, huge masses of trap, capped by a thin layer of laterite. Both are within sight of the sea. Both are swept by the same dry winds in the cold weather and by the same monsoon storms, and both enjoy the full benefit of the monsoon rains. The average mean temperature ranges at Mahableshwar from 64° F. to 76°; and from 69° to 78° at Matheran. The average rainfall at Mahableshwar amounts to 263 inches; and at Matheran to 242 inches. Under such concordant influences, we find a general likeness in the forms of vegetation on the two hills, due to the frequent presence of the same characteristic plants on both. Everywhere at Mahableshwar, as at Matheran, we find the Myrtle tribe represented by endless woods of the beautiful Jambul tree (*Eugenia Jambolana*), the Melastomas by the Anjan (*Memecylon edule*), the Laurels by the Pisa (*Actinodaphne Hookeri*), and the Madder tribe by the thorny Gela (*Randia dumetorum*). There is the same undergrowth of shrubs and herbaceous plants, the natural orders of "Leguminosæ," "Acanthaceæ" and "Compositæ" being especially and numerously represented. There are many showy climbers and trailers and creepers common to both hills; as there are Orchids and Dendrobiums and other parasitic plants; while everywhere the little Silver-fern covers with equal impartiality every sheltered bank and rock. The flora of both Mahableshwar and Matheran can, therefore, be conveniently included in a single Catalogue. In the present Catalogue, which contains the names of 493 plants, while the former one contained only 218 names, I have included a few plants which are not actually found on either hill, but which are conspicuous enough to catch the eye of even the most rapid traveller on the well-worn road from Poona, by the Kartraj and Khandala Gháts, to Panchgani and Mahableshwar. I could never have prepared so full a list without Dr. Cooke's help. He has kindly lent me his valuable Monograph on the Flora of Mahableshwar, of which I have endeavoured to make good use. He has also revised the proof-sheets of these pages, and added notes, where necessary. It only remains for me to add that this Catalogue is framed on the same general plan as the former one, and with the same object. It is meant, with the aid of the appended index of vernacular names, to furnish a ready method of learning the scientific names of plants. Many visitors to the hills take an interest in learning those names even if they have no intention of undertaking the serious study of Botany in any of its various branches. With some, however, the interest thus acquired leads to further study, which becomes all the pleasanter for the knowledge which has been gained, without too much trouble, of the names by which the plants in which they are interested are known to the scientific world; just as it is pleasanter and more profitable to study the grammar of a new language after the student has acquired some portion of its vocabulary, and learnt to speak it a little, than before. For the use of those who wish to become better acquainted with the hill flora, and are disposed to correct the Catalogue or to add new names and notes to it, I have asked Mr. Sterndale to issue a few interleaved copies in pamphlet form, which can be procured from the Secretary.

CATALOGUE.

NOTE.—In the first two columns, the nomenclature adopted for the first 74 Orders is that of Hooker's "Flora of British India," Vols. I.—IV., and Vol., V. Part I., which do not include Orders 75—99, represented in this Catalogue. The synonyms in the second column, in the case of plants belonging to the first 74 Orders, are the names under which the plants are described in Dalzell and Gibson's "Bombay Flora," or in Graham's "Catalogue." The words "Herb. Co.," after the name of a plant in this column, indicate that the Mahableshwar herbarium, presented to the Society by Dr. Theodore Cooke, contains a specimen of the plant. In the third column, the vernacular names are spelt according to the Hunterian system. The word 'vel' or 'yel,' which recurs frequently as a component part of a name, means a 'creeper' or 'climber.' The words 'lahan' and 'dhakta' (fem. 'dhakti') mean 'small,' 'motha' (fem. 'mothi') means 'big,' 'pandhra' means 'white,' 'kala' 'black,' 'tambda' 'red, and 'kadu' 'bitter.' ' The prefix 'ran' indicates a 'jungle' plant, or, as we should say, 'a wild plant,' though all the hill plants in the list are probably wild or indigenous on Mahableshwar or Matheran, with the exception perhaps of the large-flowered' yellow flax (Reinwardtia trigyna), the Indian raspberry (Rubus lasiocarpus), the strawberry (Fragaria vesca), the Brugmansia candida, the mulberry (Morus arropurpurea), and the Jack-tree (Artocarpus integrifolia). The Reinwardtia is said, however, by Major H. H. Lee, R. E., to be "found truly wild on Varandha Ghat" in the Satara District. ("Gazetteer of the Bombay Presidency," Vol. XIX. App. A.) The Morus atropurpurea of the Mahableshwar gardens is, perhaps, a variety of Morus alba, the home of which "is probably China." (Brandis.) According to Wight and Beddome, the Jack-tree is "wild in the mountain forests of the Western Ghats, ascending to 4,000 feet." But Dr. Brandis remarks that "regarding its native home there is yet some uncertainty."

DIVISION A—VASCULARES.—(*Plants with woody fibre and cellular tissue*).

CLASS I.—DICOTYLEDONES.*

SUB-CLASS—1 THALAMIFLORÆ. †

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
1 Ranunculaceæ (The Butter-cup Order.)	Clematis Gouriana, *Herb. Co.*	Mor-vel, Mor-yel, Ránjai. Traveller's joy. Matheran; Koyna Valley.
„	„ Wightiana	*ib.* Mahableshwar.
2 Dilleniaceæ	Dillenia pentagyna	Karambel, Dhákta Karmal.

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* In the seeds of Dycotyledones there are always two cotyledons at least, and if there are two only they are always opposite.

† The differences of the four sub-classes into which De Candolle divides the class of Exogens or Dicotyledones "might be, in most cases, expressed thus :—

1. Polypetalous.
    Stamens hypogynous.................. = *Thalamifloræ.*
    Stamens perigynous .... = *Calycifloræ.*
2. Monopetalous .... = *Corollifloræ.*
3. Apetalous ... . = *Monochlamydeæ.*

' It is, however, to be observed that some of the Calycifloræ and Thalamifloræ have a monopetalous corolla. In this classification, the student proceeds from what

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
3 Anonaceæ. (The Custard-apple Order).	Uvaria Narum	Naram-panal.
,,	,, lurida	
,,	Bocagea Dalzellii, *Syn.* Sagerœa laurina.	Sajeri, Har-kinjal.
4 Menispermaceæ	Cocculus macrocarpus, *Herb. Co.*	Vátoli, Vát-vel, Wâtan-yel.
,,	,, villosus *	Tán, Vásanvel. *Sans.* Vásadani.
,,	Cyclea peltata, *Herb. Co.*	Pár-yel, Pádel.
5 Papaveraceæ	Argemone mexicana†, *Herb. Co.*	Mexican Poppy.
6 Cruciferæ. (The Cabbage Order.)	Nasturtium officinale, *Herb. Co.*	Water-cress.
,,	Cardamine subumbellata *Herb. Co.*	
7 Capparideæ	Capparis spinosa, *Herb. Co.*	Indian Caper. "The young flower buds are the capers of commerce." (Lee.)
,,	,, pedunculosa	Kolisna.
,,	,, longispina, *Herb. Co.*	*ib.*
,,	,, horrida	Near Alexander Point, Matheran.
8 Bixineæ (The Arnotto Order.)	Flacourtia Ramontchi,‡ *Herb. Co.*	Támbat *Sans.* Svádu Kantak.
9 Pittosporeæ	Pittosporum floribundum, *Herb. Co.*	Yekadi.
10 Polygaleæ	Polygala persicariæfolia	Mahableshwar Milk-wort.
11 Portulaceæ	Portulaca oleracea, *Herb. Co.*	Ghol-báji.
12 Tamariscineæ	Tamarix ericoides	Jao, Sarub, Saráta. Tamarisk. In the river bed, near Neral station.
13 Guttiferæ	Garcinia indica	Kokam, Rátambá. Wild Mangosteen.
,,	,, ovalifolia, *syn.* Xanthochymus ovalifolius.	Haldi. Matheran Gamboje tree.
,,	Ochrocarpus longifolius, *Syn.* Calysaccion longifolium.	Harkia, Surangí.

are considered the most perfectly organized Exogens to those which are least so. Thus all the parts are present and distinct from each other in Thalamifloræ; other things remaining the same, the stamens adhere to the calyx in Calycifloræ; the stamens join the petals and the petals each other in Corollifloræ; and in Monochlamydeæ, first the corolla disappears, and then, among the most incomplete orders, the calyx also ceases to be developed." (Lindley's "School Botany.") Orders 43, 44, 45 in this Catalogue are placed under "Calycifloræ," in accordance with De Candolle's arrangement. According to the plan adopted by Lindley, these orders would come under "Corollifloræ."

* The juice of the ripe berries of the *Cocculus villosus* "makes a durable bluish-purple ink. The leaves rubbed in water thicken into a green jelly. Roots and leaves used in native medicine." (Brandis.)

† The *Argemone* is a small American genus, of which this species is "naturalized throughout India." (Hooker.)

‡ The wood of *Flacourtia Ramontchi* "does not warp, is durable, and not attacked by insects. Combs are made of it; it is employed in turnery and for agricultural implements, and though not large, it is occasionally used for building." (Brandis.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
14 Dipterocarpeæ	Ancistrocladus Heyneanus.	Kardor, Kardori. A handsome climbing shrub, with large, smooth, elliptic leaves and hooked branches. Not uncommon at Matheran.
15 Malvaceæ. (The Mallow Order.)	Sida carpinifolia, *Herb. Co.*	Chikni. It "is used to make besoms, the twigs being at once supple and tough." (Lee.)
,, ...	Abutilon polyandrum	
,, ...	Urena sinuata	
,, ...	Hibiscus hirtus	
,, ...	Thespesia Lampas	Rán-bhendi, Lahán Bhendi. Wild Bhendy.
,, ...	Bombax malabaricum. *Syn.* Salmalia malabarica.	Sávar, Támbdi Sávar. Silk-cotton tree. *Sans.* Rakta-sálmali. The wood is "used for planking, packing cases, toys, scabbards, fishing-floats and for the lining of wells. * * The calyx of the flower-bud is eaten as a vegetable. The fruit is collected before it opens, and the cotton with which it is filled is used to stuff quilts and pillows." (Brandis.)
16 Sterculiaceæ.........	Sterculia urens*	Sáldhawal, Karai, Kuari.
,, ...	,, guttata	Goldor, Gordar, Kukar.
,, ...	,, colorata	Bhaikui, Khavas, Kaushi. The bark is "made into rope." (Brandis.)
17 Tiliaceæ. (The Linden Order.)	Grewia tiliæfolia	Dháman. "Made into shafts, shoulder poles for loads, pellet-bows, handles, masts, oars, employed in carriage building. From the inner bark, cordage is made in Bombay. Twigs and leaves lopped for fodder. Fruit eaten, of an agreeable acid flavour." (Brandis.)
,, ...	,, Microcos, *Herb. Co.*	
,, ...	Erinocarpus Nimmoanus...	Chaura, Chor, Cher.
,, ...	Triumfetta pilosa	Kutre-vándre, *i.e.*, "Dogs and Monkeys."
,, ...	,, rhomboidea, *Herb. Co.*	Necharda.
,, ...	Elæocarpus oblongus, *Herb. Co.*	Kásu, Khás. At Lingmala and near "Temple Hall," Mahableshwar.
18 Lineæ	Linum mysorense, *Herb. Co.*	Bámburti, Wúndri. Yellow Flax.
,, ...	Reinwardtia trigyna	Abai. Large flowered yellow flax. In gardens at Mahableshwar and Matheran.
19 Geraniaceæ. (The Cranesbill Order.)	Oxalis corniculata, *Herb. Co.*	Nálkarda. Yellow sorrel.

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* The *Sterculia urens*, though not common, is conspicuous on the Matheran Ghát by its cream-coloured, pink and white, shining bark, the thin, transparent coating of which peels off "like that of the birch." Sitars (native guitars), are made of the wood. It yields a gum which is "sold under the name of *katila, katira*." The seeds are "eaten by Gonds and Kurkus in the Central Provinces." (Brandis.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
19 Geraniaceæ (*contd.*)	Impatiens acaulis, *Herb. Co.*	Lahán Terda, Berki. Stemless Balsam. Rare at Matheran. Not so rare at Mahableshwar, where it grows on wet rocks near streams. It is a small but handsome plant, with large, pale-mauve flowers. "Well worthy of a place in the conservatory." (Lee.)
,,	,, inconspicua	
,,	,, oppositifolia	Sanmukh patri, Terda.
,,	,, Dalzellii, *Herb. Co.*	Yellow Balsam.
,,	,, Balsamina, *Herb. Co.*	Terda. Wild Balsam.
20 Rutaceæ (The Rue Order.)	Evodia Roxburghiana	
,,	Toddalia aculeata	
,,	Glycosmis pentaphylla, *Herb. Co.*	Kirmíra.
,,	Murraya exotica, *var.* paniculata.	Pándri, Kuntí. Below Chowk and Hart Points, Matheran. Rare.
,,	,, Kœnigii, *Syn.* Bergera Kœnigii, *Herb. Co.*	Kadhipát, Kadhi-nimb. Curry Plant.
,,	Atalantia monophylla, *Herb. Co.*	Mákad-limbu, *i.e.*, "Monkey lime."
21 Burseraceæ	Boswellia serrata. *Syn.* B. thurifera.	Sálphali, Sálera, Halera. Frankincense tree. On the Kartraj and Khandala Gháts, on the road to Mahableshwar.
,,	Garuga pinnata	Karak. "Bark employed for tanning, a gum exudes from it. The fruit is eaten, raw and pickled." (Brandis.) On Matheran Ghát.
22 Meliaceæ	Cipadessa fruticosa, *Syn.* Mallea Rothii.	Kartraj Ghát.
,,	Soymida febrifuga	Polára. Rohan. Bastard Cedar, Indian Red-wood. "The bark is bitter, and has been used as a substitute for cinchona bark." (Brandis.)
,,	Chloroxylon Swietenia	Billu, Halda.
23 Olacineæ	Mappia fœtida (M. oblonga in *Herb. Co.*)	Gánera.

Sub-Class 2.—Calycifloræ.

24 Celastrineæ (The Spindletree Order.)	Gymnosporia Rothiana	Mothi Yekadí, Yekalí, Yenklí.
,,	,, montana, *Syn.* Celastrus montana.	Yekadi.
,,	Hippocratea Grahami	Yeoti.
25 Rhamneæ (The Buckthorn Order.)	Ventilago madraspatana.	Kán-vel, Lokhandi.
,,	Zizyphus xylopyrus	Guti, Ghuti. Hart Point, Matheran; and on the road to Garbet Point.
,,	,, rugosa, *Herb. Co.*	Toran.
,,	Scutia indica, *Herb. Co.*	Chimat, "Wait-a-bit" thorn.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
26 Ampelideæ (The Vine Order.)	Vitis discolor, *Syn.* Cissus discolor.	Telicha-vel.
"	" tomentosa	Shend-vel.
"	" latifolia, *Syn.* Cissus latifolia.	Nádena.
"	" auriculata, *Syn.* Cissus auriculata.	Jangli Kájorni.
"	" lanceolaria	Kajgolicha-yel.
"	Leea sambucina, *Syn.* L. staphylea, *Herb. Co.*	Dhindi, Dindi.
27 Sapindaceæ (The Soapwort Order.)	Hemigyrosa canescens. *Syn.* Cupania canescens	Karpa.
"	Allophylus Cobbe, *Syn.* Schmidelia Cobbe. *Herb. Co.*	Tipan.
"	Schleichera trijuga.*	Kosum, Kusam, Koham, Kocham.
"	Nephelium longana, *Herb. Co.*	Wumb. "Fruit size of a cherry, reddish or purple. Aril wholesome." (Lee). Koyna Valley, Mahableshwar.
28 Anacardiaceæ (The Cashew Order.)	Mangifera indica	Amba. Mango tree.
29 Connaraceæ	Connarus monocarpus	Sundar.
30 Leguminosæ	Crotalaria vestita, *Herb. Co.*	
"	" triquetra, *Herb. Co.*	
"	" nana. *Herb. Co.*	
"	" retusa	Ghágri.
"	" Leschenhaultii.. *Herb. Co.*	Daeli, Dingala.
"	Indigofera pulchella, *Herb. Co.*	Nerda. Wild Indigo. Near Yenna Falls, Mahableshwar.
"	Geissapsis cristata	Barki.
"	" tenella	Lahán Barki.
"	Zornia diphylla	Nál-Barga, Berki.
"	*ib.*, *var.* zeylonensis	Barga, Berki.
"	Smithia purpurea, *Herb. Co.*	
"	" setulosa, *Herb. Co.*	
"	" blanda, *Herb. Co.*	Mothi Berki.
"	Alysicarpus vaginalis, *var.*, nummularifolius.	Dháktá Dhampta.
"	" longifolius	Dhámpta.
"	Desmodium parviflorum, *Herb. Co.*	
"	Erythrina indica	Pangára, Páramga.
"	Butea frondosa†	Palas, Khákra. *Sans.* Palása. The "Flame of the Forest."
"	Phaseolus trinervius, *Herb. Co.*‡	Mungir.

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* In many parts of India, *lac* is produced on the young branches of the *Schleichera*. "In Oudh, this tree is lopped, and the twigs and leaves are used as cattle-fodder during the dry season. Oil is extracted from the seeds in South India and Ceylon." (Brandis.)

† The leaves of the Palas tree are given as fodder to buffaloes. The flowers are made, with alum, into the yellow dye used at the *Holi* festival. (Brandis.) This tree gives its name to the memorable plain of *Palasi*, vulgarly called "Plassey." (Birdwood's *Vegetable Products.*) It yields a *kino* and a *lac.* (*Ib.*)

‡ This plant is common throughout India. "The Seeds, said to be rich in nitrogenous principles, were largely used by the famine-stricken people." (Lisboa's *Useful Plants*).

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
30 Leguminosæ (*contd.*)	Vigna vexillata, *Herb. Co.*	Birambol, Halula, Halunda. Indian Sweet Pea.
,,	Atylosia lineata, *Herb. Co.*	Rán Túr.
,,	Cylista scariosa. *Herb. Co.*	Rán Ghevda.
,,	Flemingia strobilifera, *Herb. Co.*	Bondar.
,,	Dalbergia latifolia	Sisu, Siswa, Sisam, Táli. Black-wood tree.
,,	,, sympathetica	Pendguli-yel, Yek-yel. Ek-vel.
,,	,, volubilis	Alei.
,,	,, paniculata	Phánsi. Matheran Ghát.
,,	Mezoneurum cucullatum	Rági.
,,	Wagatea spicata	Vagáti.
,,	Cassia fistula	Báhawa, Garmala. Indian Laburnum.
,,	Bauhinia racemosa	Apta, Wanráj.
,,	Bauhinia malabarica	Kánchan.
,,	,, Vahlii	Chámbuli.
,,	Acacia catechu	Khair. *Catechu* is manufactured from the wood.
,,	,, concinna	Chikakai, Shikakai.
,,	,, Intsia, *Herb. Co.*	
,,	Albizzia stipulata	Lullei, Laeli.
,,	,, amara	Siras. *Sans.* Sarshapa. Near Alexander Point, Matheran.
31 Rosaceæ (The Rose Order.)	Pygeum Gardneri, *Syn.* P. zeylanicum, *Herb. Co.*	"The seeds smell strongly of prussic acid. The kernels of the fruit said to be used for poisoning fish." (Lee.)
,,	Rubus moluccanus, *Syn.* R. rugosus, *Herb. Co.*	Indian Blackberry.
,,	,, lasiocarpus	Mahableshwar Raspberry.
,,	Fragaria vesca, *Herb. Co.*	Strawberry.
32 Crassulaceæ (The Stonecrop Order).	Bryophyllum calycinum. *Syn.* Kalanchoe pinnata, *Herb. Co.*	Pánphue, Pánjád.
33 Rhizophoreæ. (The Mangrove Order.)	Carallia integerrima	Phansi. Wild Jacktree.
34 Combretaceæ.	Terminalia belerica	Beheda, Vehela.
,,	,, chebula*	Harda. Chebulic Myrobolan tree.
,,	,, arjuna	Arjuna.
,,	,, tomentosa, *var.* typica, *Syn.* T. glabra	Ain.
,,	Calycopteris floribunda, *Syn.* Getonia floribunda.	Bagvel, Yakshi.
,,	Combretum ovalifolium	Mád-vel.
35 Myrtaceæ. (The Myrtle Order.)	Eugenia caryophyllæa, *Herb. Co.*	
,,	,, Jambolana, *Syn.* Syzigium Jambolanum *Herb. Co.*	Jámbul, *Sans.* Jambu. Jambul tree.
,,	Careya arborea	Kumbha.

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* "The Myrobolan tree is found throughout the Satara district, but in special abundance in the Mahableshwar forests, the hill soil apparently being well suited to its growth. The fruit, the Chebulic Myrobolan of commerce, is about the size of a damson, though more pointed at one end, of a deep green colour and contains a hard seed; when dry, it becomes blackish and very hard and shrivelled. It is not edible in its natural state; but when mixed with the *Beheda* and *Avla*, the powder is taken as a stomachic and mild aperient. The fruit is much valued in tanning and dyeing. * * It is also used * * in making an ink." (Dr. W. McConaghy, "Gazetteer," Vol. XIX., Appendix B, Note.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
36 Melastomaceæ.	Memecylon edule, *Herb. Co.*	Anjan. Iron-wood tree.
37 Lythraceæ. (The Loose-strife Order.)	Ammania baccifera *Herb. Co.*	"Rocks near water on the Ghâts. This is the plant so commonly called 'Heather' by visitors at Mahableshwar." (Lee.)
,, ...	Woodfordia floribunda, *Syn.* Grislea tomentosa.	Dhauri, Dhaút.
,, ...	Lagerstrœmia parviflora...	Nanah. Benteak tree.
,, ...	,, lanceolata	
,, ...	,, Flos-Reginæ ...	Táman.
38 Samydaceæ	Casearia graveolens	Bokháda.
,, ...	,, esculenta	Mori.
39 Cucurbitaceæ (The Gourd Order.)	Trichosanthes palmata, *Herb. Co.*	Kaundal.
,, ...	Cucumis trigonus	Kat-vel.
,, ...	Zehneria Baueriana, *Herb. Co.*	Waráli. Mahableshwar Bryony.
,, ...	,, umbellata, *Herb. Co.*	Gomáti.
40 Begoniaceæ	Begonia crenata, *Herb. Co.*	
,, ...	,, malabarica.........	
41 Ficoideæ (The Fig-Marigold Order.)	Mollugo hirta, *Herb. Co.*	
42 Umbelliferæ	Hydrocotyle rotundifolia.	
,, ...	,, asiatica. *Herb. Co.**	Kárivana, Khopri, Kadu Kárandá. *Sans.* Bhráhmi.
,, ...	Pimpinella monoica, *Herb. Co.*	Bhálga.
,, ...	Peucedanum grande, *Syn.* Pastinaca grandis.	Báphli.
,, ...	Heracleum concanense, *Herb. Co.*	Pandi, Pinda. Near Elphinstone Point, Mahableshwar.
43 Rubiaceæ. (The Madder Order).	Adina cordifolia. *Syn.* Nauclea cordifolia.	Hed.
,, ...	Stephegyne parvifolia. *Syn.* Nauclea parviflora.	Kalam. Near One Tree Hill, Matheran.
,, ...	Wendlandia Notoniana. *Herb. Co.*	
,, ...	Oldenlandia corymbosa, *Herb. Co.*	A small, much branched herb, with slender, pubescent stem and branches, linear, sessile leaves, and small white flowers. Very common at Mahableshwar on the sides of paths in October. (Cooke.)
,, ...	Anotis carnosa, *Syn.* Hedyotis carnosa.	
,, ...	Mussænda frondosa†	Bhutkes, Sárwad. Near Simpson Lake, Matheran.
,, ...	Randia dumetorum, *Herb. Co.*‡	Gela. The fruit is used instead of soap by the hill people; and the pounded bark for poisoning fish. (Lisboa).

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* An infusion of the leaves of this plant was used by the late Dr. Bhau Daji in his treatment of leprosy. The juice of the leaves is sometimes prescribed, in native medicine, for Epilepsy; and is also popularly believed to be a cure for stammering, and to stimulate the intellectual faculties, if taken daily.

† This showy shrub is not very common at Matheran. It can be readily identified by its conspicuous, white, calycine leaves and its small, golden-yellow flowers.

‡ The *Gela* is very common on the hills. It is variable in size, sometimes a small tree, generally a shrub, with numerous stiff branches armed with spines, and large, fragrant, white flowers slightly tinged with greenish-yellow.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
43 Rubiaceæ (*contd.*)	Canthium umbellatum, *Herb. Co.*	Arsul, Tupa.
,, ...	,, angustifolium ...	Cháp-vel.
,, ...	Vangueria spinosa, *Syn.* V. edulis, *Herb. Co.*	Alu. Indian Medlar.
,, ...	Ixora nigricans	Lokhandi, Atkura.
,, ...	Pavetta indica, *Herb. Co.*	Pápat, Pháphat. Matheran Coffee.
,, ...	,, hispidula, *var.* siphonantha.	
,, ...	Psychotria truncata	
,, ...	Rubia cordifolia, *Herb. Co.*	Itári. Indian Madder. The roots furnish the dye called Manjit. (Balfour's Botany.)
44 Compositæ	Centratherum phyllolænum, *Herb. Co.*	
,, ...	,, tenue	
,, ...	Lamprachænium microcephalum.	
,, ...	Adenoon indicum, *Herb. Co.*	Kusamb, Mothi Sonki.
,, ...	Vernonia cinerea	Mothi Sadori, Sahadevi.
,, ...	,, divergens. *Syn.* Eupatorium divergens, *Herb. Co.*	Bondar.
,, ...	Adenostemma viscosum, *Herb. Co.*	Jirao, Jangli Jirao.
,, ...	Ageratum conyzoides, *Herb. Co.*	
,, ...	Dichrocephala latifolia, *Herb. Co.*	
,, ...	Cyathocline lyrata	Gangotri.
,, ...	Conyza stricta	
,, ...	Blumea glomerata, *Syn.* B. holosericea.	Bhámburda.
,, ...	Gnaphalium luteo-album.	
,, ...	Vicoa cernua	
,, ...	Wedelia urticæfolia, *Syn.* Verbesina biflora, Wollastonia biflora.	Sonki.
,, ...	Spilanthes Acmella	
,, ...	Bidens pilosa, *Syn.* B. Wallichii.	
,, ...	Tridax procumbens, *Herb. Co.*	
,, ...	Artemisia parviflora, *Herb. Co.*	Dauni.
,, ...	Gynura nitida, *Syn.* G. simplex, *Herb. Co.*	Dáhn. Sow-thistle.
,, ...	Notonia grandiflora. *Syn.* Cacalia Kleinii.	Cabbage tree. Khandala Ghát, near Mahableshwar.
,, ...	Senecio Lawii	
,, ...	,, Grahami	Sonki.
,, ...	,, belgaumensis, *Syn.* Madacarpus belgaumensis.	
,, ...	Calendula officinalis	Makmal. Marigold. Kartraj and Khandala Gháts.
,, ...	Tricholepis glaberrima, *Herb. Co.*	Motha Búr, Búr. Fitzgerald Ghát and near Bombay Point, Mahableshwar.
,, ...	Lactuca Heyneana	Wild Lettuce.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
45 Campanulaceæ	Lobelia trigona, *Herb. Co.*	
„	Lobelia nicotianæfolia, *Herb. Co.*	Dháwal, Devnal. A tall, erect plant, with hollow stems, and large, light-green, lanceolate leaves, and a dense terminal raceme of white flowers. Seeds small, ellipsoid, acrid.
„	Cephalostigma flexuosum..	
„	Wahlenbergia gracilis ...	
	SUB-CLASS 3.—COROLLIFLORÆ.	
46 Myrsineæ	Moesa indica, *Herb. Co.*	Atki, Atak.
„	Embelia ribes, *Syn.* E. glandulifera, *Herb. Co.*	Waiwarang.
„	„ robusta, *var.* ferruginea, *Syn.* E. Basaal.	Ambti.
„	„ *Sp.?*	Khápri Yel.
47 Sapotaceæ	Sideroxylon tomentosum, *Syn.* Sapota tomentosa, *Herb. Co.*	Kánta-Kumbal.
„	Bassia latifolia	Mavra, Mohova. Mowrah Tree. Matheran Ghát.
„	Mimusops Elengi	Bokul, Bakuli. Below Simpson Lake, Matheran.
48 Ebenaceæ	Diospyros montana, *Syn.* D. Goindu.	Goindu.
„	„ assimilis, *Syn.* D. nigricans.	Malia. Indian Ebony.
49 Styraceæ	Symplocos Beddomei *Syn.* Hopea racemosa.*Herb.Co*	Hurá, Lenda. Koyna Ghát.
50 Oleaceæ	Jasminium arborescens. *var.* latifolium, *Herb. Co.*	Kusar. Matheran Jasmine.
„	Olea dioica	Pár Jámbul, Párjam. Wild Olive.
„	Ligustrum neilgherrense, *Herb. Co.*	Lokhandi, Mersingha. Mahableshwar Privet.
51 Apocynaceæ. (The Dogbane Order.)	Carissa Carandas..	Karvand, Corinda. Corinda Bush.
„	Rauwolfia densiflora, *Herb. Co.*	
„	Holarrhena antidysenterica.	Kuda. *Sans.* Kutaja. The seed is called Indrajava (*Sans.* Indrayava) and is used as a vermifuge and febrifuge.
„	Tabernæmontana dichotoma.	Taital.
„	„ crispa	Pándhra Kúda.
„	Wrightia tinctoria	Kála Kuda.
„	Anodendron paniculatum.	Lámtáni. Dr. MacDonald's "Seed-Traveller." See the Society's Journal, Vol. I., p. 237.
52 Asclepiadeæ. (The Milkweed Order.)	Calotropis gigantea	Rui, Ark. Madár.
„	Gymnema silvestre.[*] *Herb. Co.*	Kaoli, Pitáni, Dodi, Dudhroli Sirdoli.

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[*] The leaves of this climber have the property, when chewed, of neutralizing for a time, the taste of saccharine substances. It may be identified by its slender green branches and numerous dense umbels of yellowish green flowers rather than by its most common vernacular name, Kaoli, which is applied to many of the twining asclepiads. (Cooke.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
52 Asclepiadeæ (*contd.*)	Dregea volubilis *Herb. Co.*	Kaoli. Near the top of the Rotunda Ghát and at Babington Point, Mahableshwar.
,,	Dischidia bengalensis	
,,	Hoya retusa	Dhákti Ambri. Golden Fringe.
,,	,, Wightii. *Syn.* H. pallida.	Ambri, Dudh-yel. Wax plant.
,,	Leptadenia reticulata	Khár-Khodi.
53 Loganiaceæ	Buddleia asiatica, *Herb. Co.*	
,,	Strychnos colubrina	Kanal, Kájar-vel. Strychnine Creeper. Near Simpson Lake, Matheran.
,,	,, potatorum	Niwali, Nirmali. Near Hart Point, Matheran.
54 Gentianaceæ	Exacum bicolor	
,,	,, Lawii	Jatáli. Mahableshwar Gentian. Very common amongst grass in October; dies very soon after the end of the rains. (Cooke.)
,,	,, petiolaret	
,,	Canscora diffusa	Common along shady roadsides, both at Matheran and Mahableshwar. (Cooke.)
,,	Swertia decussata	Kauri. Flowers in November, in grassy places. Tolerably abundant in the fields between the Satara Road and Lingmala, Mahableshwar. Used as a febrifuge. (Cooke.)
55 Boragineæ	Trichodesma zeylanicum	
,,	Paracaryum cælestinum. *Syn.* Cynoglossum cælestinum. *Herb. Co.*	Nechurdi. Mahableshwar "Forget-me-not."
,,	,, malabaricum. *Herb Co.*	
,,	,, Lambertianum. *Herb. Co.*	
56 Convolvulaceæ	Argyreia sericea	Gavel.
,,	,, malabarica	
,,	Lettsomia setosa, *Syn.* Argyreia setosa.	Gárud-yel.
,,	Ipomæa dissecta, *Syn.* I. coptica.	
,,	Porana malabarica, *Syn.* P. racemosa, *Herb. Co.*	Bhauri. The "Snow creeper." Flowers in October and November, in many parts of Mahableshwar, and along the Garbet Road, Matheran. Flowers small, funnel-shaped, pure white. The dry scariose calyx is often seen on the withered plants in the hot season. (Cooke).
57 Solanaceæ. (The Potato Order.)	Solanum nigrum	Kámani. Common in gardens below the bazaar, and below the lake, Mahableshwar. (Cooke).
,,	,, denticulatum, *Herb. Co.*	Karad Kángoni.
,,	,, giganteum, *Herb. Co.*	Kutri.
,,	,, indicum, *Herb. Co.*	Chiturti, Bhui-vángi.
,,	Nicandra physaloides	Kartraj Ghát.
,,	Datura fastuosa, *var* alba.	Dhotra.
,,	,, Metel?	

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
57 Solanaceæ. (*contd.*)	Brugmansia candida, *Herb. Co.*	Motha Dhotra. (Not described in Hooker's "Flora of British India").
58 Scrophularineæ. (The Figwort Order)	Limnophila racemosa	
,, ...	,, gratioloides ...	
,, ...	Herpestis Monniera, *Herb. Co.*	Flowers in April and May.
,, ...	Bonnaya veronicæfolia ...	Shewál.
,, ...	Striga orobanchioides* ...	
,, ...	Ramphicarpa longiflora ...	
,, ...	Centranthera hispida	
,, ...	Sopubia delphinifolia, *Herb. Co.*	
,, ...	Pedicularis zeylanica	
59 Lentibulariaceæ ...	Utricularia albo-cærulea, *Herb. Co.*	Kájutcha-ghás. Not very common. Grows in patches in the wet grass near the Dhobi's Waterfall, Mahableshwar.
,, ...	,, cærulea	Bladder-wort.
60 Bignoniaceæ	Hetrophragma Roxburghii, *Herb. Co.*	Wáras.
,, ...	,, adenophyllum ...	Pádel.
61 Acanthaceæ	Thunbergia fragrans	Eri-yél.
,, ...	Hygrophila Serpyllum. *Syn.* Physichilus Serpyllum, *Herb. Co.*	Rán-tewan.
,, ...	Phaylopsis parviflora, *Syn.* Ætheilema reniforme.	Waiti.
,, ...	Dœdalacanthus purpurascens, *Syn.* Eranthemum nervosum.	
,, ...	Strobilanthes asperrimus..	Kárvi. Indian Wattle.
,, ...	,, Heyneauus.	Ankra.
,, ...	,, ixiocephalus, *Syn.* S. Neesianus.	
,, ...	,, callosus. *Herb. Co.*	
,, ...	,, perfoliatus...	
,, ...	Calacanthus Dalzelliana, *Syn.* Lepidagathis grandiflora.	Matheran. Flowers large, purple.
,, ...	Blepharis asperrima. *Herb. Co.*	Pahádi-atgan.
,, ...	Barleria Prionitis	Common at Matheran. Flowers yellow.
,, ...	,, grandiflora	Matheran. Flowers large, white.
,, ...	,, courtallica	Itári.
,, ...	,, strigosa, *var.* terminalis, *Herb. Co.*	Koránti. Flowers in November. Flowers blue, the tube of the corolla much paler than the limb. Stigma purple. A handsome, showy plant.
,, ...	Asystasia violacea	
,, ...	Haplanthus verticillaris. *Herb. Co.*	Kála kírát, Kála ánkra.
,, ...	Lepidagathis cuspidata. *Herb. Co.*	

---

* This strange-looking little plant may be readily identified by its dark, reddish-purple stem, branches, and scale-like leaves, and its terminal spike of pink flowers, which have a white spot at the base of each division of the corolla. It grows on rocks and is sometimes parasitical on the roots of other plants. It flowers in November.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
61 Acanthaceæ. (*contd.*)	Justicia trinervia, *Syn.* Adhatoda trinervia.	Súta. Near Elphinstone Point, Mahableshwar; abundant.
,, ...	,, procumbens. ... *Herb Co.*	Tharambal.
,, ...	Ecbolium Linneanum, *Syn.* Justicia ecbolium.	Dhákta-adulsa.
,, ...	Rungia parviflora, *Herb. Co.*	
,, ...	Dicliptera zeylanica, *Syn.* D. bivalvis, *Herb. Co.*	
62 Verbenaceæ	Callicarpa lanata, *Syn.* C. cana. *Herb. Co.*	Yesur, Eshwar.
,, ...	Tectona grandis	Ság, Ságwán. Teak tree.
,, ...	Premna coriacea, *Syn.* P. scandens.	Chámbar-vel.
,, ...	Gmelina arborea...........	Shewan. The pale yellow, close-grained wood of this tree is highly esteemed for planking, furniture, the panels of doors &c. (Brandis.)
,, ...	Vitex negundo. *Herb. Co.*...	Nigud, Nigadi. *Sans.* Nirgundi. The leaves are aromatic. In native medicine, the bruised leaves are applied to the temples as a cure for headache. (Cooke.)
,, ...	,, leucoxylon	Koyna Valley.
,, ...	Clerodendron serratum. *Herb. Co.*	Borungi, Borsangi, Bhárang. Near the dharmsala, between Mahableshwar and Panchgani.
63 Labiatæ	Plectanthrus Wightii	
,, ...	Coleus parviflorus?	Khápri. Near Elphinstone Point, Mahableshwar.
,, ...	Lavandula Gibsoni	Indian Lavender. On the Ghâts on the Mahableshwar road.
,, ...	Pogostemon parviflorus, *Syn.* P. purpuricaulis, *Herb. Co.*	Pángla, Pángli. As to the use of the leaves of this plant, as a supposed cure for snakebite, see the note at p. 210 of Vol. I. of the Society's Journal.
,, ...	Dysophylla myosuroides. *Herb. Co.*	Shewal.
,, ...	,, salicifolia ...	
,, ...	,, stellata	Marvá.
,, ...	,, gracilis. *Herb. Co.**	
,, ...	Colebrookia oppositifolia. *Syn.* C. ternifolia. *Herb. Co.*	Bhâman.
,, ...	Micromeria stellata. *Syn.* M. Malcolmiana. *Herb. Co.*	Karwat.
,, ...	Salvia plebeia	
,, ...	Scutellaria discolor. *Syn.* S. indica.	

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* *Dysophylla gracilis* is probably only a tall form of *D. stellata.* (Hooker, Vol. IV. p. 641). The latter plant can be readily known, when in flower in October, by its narrow, linear, whorled leaves, and its slender spikes of minute, closely-packed, dark purple flowers. It grows in patches on the roadside near Sydney Point, Mahableshwar.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
63 Labiatæ (*contd.*) ...	Anisomeles Heyniana......	Chaudhára.
,, ...	,, ovata...........	
,, ...	,, malabarica ...	On the Kartraj Ghát. Flowers in November. This beautiful plant can be readily identified by the snow-white, appressed wool which clothes its stem and branches, by its large, thick leaves and its dense whorls of pale-purple flowers.
,, ...	Leucas stelligera. *Herb. Co.*	Guma, Borambi.
,, ...	,, ciliata *Herb. Co.* ...	Borambi. Mahableshwar Dead Nettle. Flowers in the cold season. Not so common as L. stelligera. May be identified by the short, dense, yellowish brown hairs on the helmet-shaped upper lip of the corolla (Cooke.)
,, ...	Teucrium tomentosum ...	

Sub-Class 4.—Monochlamydeæ.

64 Plantagineæ.........	Plantago major. *Herb. Co.*	English plantain.
65 Amarantaceæ	Celosia argentea. *Herb. Co.*	Quail grass.
,, ...	Achyranthes aspera. *Herb. Co.*	Saráta. Burr plant.
,, ...	Alternanthera sessilis. *Herb. Co.*	
66 Chenopodiaceæ. (The Goose-foot Order.)	Chenopodium ambrosoides	Dauni.
67 Polygonaceæ. (The Buck-wheat Order.)	Polygonum plebejum, *var.* elegans.	
,, ...	,, glabrum	Sheral. In the lake, Mahableshwar with the next species.
,, ...	,, barbatum. *Syn.* P. rivulare.	Dhákta Sheral.
,, ...	,, alatum *Herb. Co.*	
,, ...	,, chinense. *Herb. Co.*	Nárali, Paral. Indian Buck-wheat. Very common everywhere at Mahableshwar.
68 Piperaceæ............	Piper Hookeri	Dongri Mirchi. Hill pepper.
,, ...	,, sylvestre	
,, ...	Peperomia portulacoides...	Gúlúm.
69 Laurineæ. (The Laurel Order.)	Machilus macrantha *Syn.* M. glaucescens.	
,, ...	Actinodaphne Hookeri, *Syn.* A. lanceolata, *Herb. Co.*	Pisa.
,, ...	Litsæa tomentosa, *Syn.* Tetranthera apetala.	
,, ...	,, polyantha, *Syn.* Tetranthera monopetala.	Kála-Pisa.
,, ...	,, Stocksii, *Syn.* Tetranthera lanceæfolia.	
,, ...	,, fuscata	
,, ...	,, zeylanica	

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Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
70 Thymelaceæ.........	Lasiosiphon eriocephalus, *Syn.* L. speciosus, *Herb. Co.*	Rametá. Plentiful on little Chauk Point, Matheran, and common on both hills. The bark, which has a very strong fibre, is used by the hill coolies for tying bundles of grass and wood. Used also for poisoning fish.
71 Elæagnaceæ.........	Elæagnus latifolia, *Syn.* E. Kologa, *Herb. Co.**	Ambulgi.
72 Loranthaceæ (The Mistleto Order.)	Loranthus Wallichianus ...	The name Bánda or Vánda is commonly given to all these parasitic plants.
,, ...	,, obtusatus, *Herb. Co.*	
,, ...	,, cuneatus, *Herb. Co.*	
,, ...	,, elasticus, *Herb. Co.*	
,, ...	Loranthus involucratus ...	Baudguli.
,, ...	,, lageniferus......	
,, ...	,, loniceroides ...	
,, ...	Viscum angulatum, *Herb. Co.*	Indian Mistleto.
73 Santalaceæ (The Sandalwood Order.)	Osyris arborea, *Syn.* O. Wightiana, *Herb. Co.*	Lotal.
74 Balanophoreæ	Balanophora	The genus is inserted on the authority of Mrs. Hart's "Note on a supposed Root-Parasite found at Mahableshwar in October, 1885." See the Society's Journal, Vol. I., p. 75. †
75 Euphorbiaceæ (The Spurgewort Order)	Euphorbia Rothiana. *Herb. Co.*	Dúdhi.
,, ...	,, nereifolia	Thor.
,, ...	,, parviflora	
,, ...	,, acaulis...........	Kirkind.
,, ...	Homonoyia riparia, *Herb. Co.*	
,, ...	Briedelia retusa, *Syn.* B. montana *Herb. Co.*	Hasána, Asána.
,, ...	Phyllanthus madraspatana.	Kanocha.
,, ...	,, lanceolanus *Herb. Co.*	
,, ...	Flüggea leucopyrus.........	Pándharphali.
,, ...	Tragia involucrata. *Herb. Co.*	Kúlti. Sting-nettle Creeper.
,, ...	Macaranga Roxburghii ...	Chandára.

---

* This beautiful species is very variable in habit, taking the form of either a bush, a small tree or a climber (Hooker). At Matheran, it is generally found as a large climber and is readily identified by its oblong, elliptic leaves, which are silvery-white or rusty-red beneath.

† Mr. W. E. Hart gives the following description, from memory, of the specimens collected by him. "My specimens approach the description of *B. indica* nearer than any of the others" (See Hooker, Vol. V. pp. 237, 238.) "The rootstock was tuberous or warty. The peduncle-scales yellowish. * * * They lay close on the peduncle, and * * were imbricate, but separated at the upper extremities. The heads were certainly globular and 1-sexual, reddish brown in colour. The flowers were diœcious, white in colour. The stamens of the male flower united into a central column of conical shape. The peduncles were of all lengths from 1 to 6 inches high, and decidedly thick for their length. The heads were of all sizes from marbles to bagatelle balls."

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
75 Euphorbiaceæ (*contd*).	Mallotus philippinensis, *Syn.* Rottlera tinctoria, *Herb. Co.*	Rohen, Ruen, Kapila, Shendri.
,, ...	Croton hypoleucos	Pandurai.
,, ...	,, Lawianus	Borambi.
,, ...	,, ramiflorum	Kávala.
,, ...	Ceratogynum rhamnoides..	Chickli.
,, ...	Phyllanthus Emblica	Awal. Gooseberry tree.
,, ...	,, lanceolarius, *Herb. Co.*	Bhoma.
76 Urticeæ (The Nettle Order).	Elatostemma oppositifolia.	
,, ...	Fleurya interrupta.	Khájoti.
,, ...	Gerardina heterophylla... *Herb. Co.*	Mothi Khájoti, Agia, Agarra.
,, ...	Splitgerbera scabrella. ...	
,, ...	Debrigascea longifolia. ...	
,, ...	Trema Wightii, *Syn.* Sponia Wightii, *Herb. Co.*	Gol.
,, ...	Ficus heterophylla.........	
,, ...	,, oppositifolia.	Kharoti.
,, ...	,, bengalensis...........	Wad. Banyan tree. Below Chowk Point.
,, ...	,, religiosa *var.* ?	Ashta.*
,, ...	,, infectoria	Kel.
,, ...	,, retusa..................	Nándruk, Ránekuit.
,, ...	,, cordifolia	Pahir.
,, ...	,, volubilis.....	Datir. Climbing Fig.
,, ...	,, glomerata	Umbar. *Sans.* Udumbar. The Sycamore tree of the Bible.
,, ...	,, asperrima	
,, ...	Morus atropurpurea	Situt, Shah-tut. Mulberry.
,, ...	Artocarpus integrifolia ...	Phanas. *Sans.* Panasa. Jack-tree.
77 Salicaceæ	Salix tetrasperma. *Herb. Co.*	Walunj. Willow.
78 Gnetaceæ	Gnetum scandens	Umli.

CLASS II.—MONOCOTYLEDONES.†

SECTION 1.—*Stamens epigynous.*

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
79 Orchideæ	Oberonia recurva............	
,, ...	Microstylis Rheedii. *Herb. Co.*	
,, ...	Dendrobium Lawanum, *Herb. Co.*	Bechu. This name is commonly given to all Dendrobiums.
,, ...	,, Macræi	
,, ...	,, ramosissimum.	
,, ...	,, microbolbon..	
,, ...	,, chlorops	
,, ...	,, barbatulum. *Herb. Co.*	
,, ...	Cirrhopetalum fimbriatum.	The "Umbrella orchis"; so named by Mrs. Jerdon.
,, ...	Eria braccata	

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* The Ashta is distinguished by the hill people from the Pipal of the plains, of which it is perhaps a variety. The name "Ashta" has no connection, apparently, with the Sanskrit name of the Pipal, "Ashvatth."

† In the seeds of Monocotyledones there is generally only one cotyledon. If there are two, they alternate with each other. The natural orders in this class are arranged according to the plan adopted in Part. II. of Loudon's Encyclopædia of Plants.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
79 Orchideæ (*contd.*)	Micropera maculata	
,,	Eulophia bicolor	Ambarkhand.
,,	,, pratensis. *Herb. Co.*	
,,	Ærides crispum	Rukhsing.
,,	,, Lindleyana	
,,	,, maculosum	
,,	Habenaria candida. *Herb. Co.*	Kalábi.
,,	,, platyphylla. *Herb. Co.*	
,,	Platanthera Susannæ. *Herb. Co.*	Only one plant of this splendid orchis has been found by Dr. Cooke at Mahableshwar, and only one at Matheran.
80 Burmanniaceæ	Burmannia triflora. *Herb. Co.*	On the road to the Governor's Bund, Matheran. Near the Dhobi's Waterfall, Mahableshwar.
81 Scitamineæ	Zinziber macrostachyum *Herb. Co.*	Sheri. Nisam. Wild Ginger.
,,	Curcuma zedoaria	Kachora, Kachola.
,,	,, pseudomontana	Rán-haldi. White turmeric.
,,	,, caulina,**Herb. Co.*	Chávar. Arrowroot.
82 Musaceæ	Musa ornata	Rán-kel, Cháwankel, Kawadar. Wild plantain.
83 Amaryllideæ	Pancratium parvum	Khandálu.
,,	Cirnum asiaticum	
,,	,, brachynema	Mahableshwar Lily.
84 Hypoxideæ	Curculigo malabarica	Kajuri.
,,	,, graminifolia	
85 Dioscoreæ	Dioscorea pentaphylla	Shend-vel, Shendon-vel.
,,	Helmia bulbifera	Kadu-karanda, Nor-vel.

SECTION 2.—*Stamens perigynous.*

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
68 Asphodeleæ	Asparagopsis sarmentosa. *Herb. Co.*	Ashwal. Asparagus creeper.
,,	Chlorophytum breviscapum.	Kula.
,,	,, Nimmonii, *Herb. Co.*	
87 Smilaceæ	Smilax ovalifolia. *Herb. Co.*	Got-vel.
88 Liliaceæ	Ledebouria hyacinthina	
,,	Anguillaria indica	
89 Commelineæ	Commelyna communis	
,,	Aneilema axillaris	Dhákti Káju.
,,	,, tuberosa	Káju. Spider-wort,
,,	Cyanotis axillaris	
,,	,, longifolia	
,,	Valisneria spiralis	
90 Eriocauleæ	Eriocaulon setaceum	Gondali.
91 Palmæ (Palms)	Caryota urens	Bherli-mád. Fish-tail Palm. For the derivation of the Marathi name, see the note at p. 211 of Vol. I. of the Society's Journal.

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* The *Curcuma caulina*, from which arrowroot has been obtained, grows abundantly everywhere at Mahableshwar. It flowers in October, and seeds freely in November.

Natural Order.	Genus and Species.	Vernacular or English name use, habitat, &c.
	SECTION 3.—*Stamens hypogynous.*	
92 Gramineæ (Grasses)	Coix lachryma	Kasai, Rán-makai. Job's Tears.
,,	Panicum prostratum	
,,	Isachne elegans	Dúnda.
,,	Oplismenus colonus	Kurund.
,,	Arundinella tenella	
,,	,, stricta	
,,	,, spicata	
,,	Setaria glauca	Kolára.
,,	Cynodon dactylon	Dúrba. Hariáli grass.
,,	Eragrostis unioloides	
,,	Bambusa stricta	Váns, Bámbu, Udha. *Sans.* Venu, Kichaka. Bamboo.
,,	,, arundo	Chivari.
,,	,, balena	Cháki.
,,	Andropogon polystachyus.	Gondal. Elphinstone Point, Mahableshwar.
,,	,, muricatus	Wala, Khaskhas. Khuskhus grass.
,,	,, *Sp. ?*	A grass, with the smell of turpentine, near the Neral Station.
,,	Anthistiria cymbaria	
,,	Psilostachys filiformis	
,,	Ischæmum conjugatum	
,,	Bathratherum molle	
,,	Pollinia eriopoda	At Panchgani. Used for paper-making.
93 Cyperaceæ	Carex indica	Indian Rush.
,,	Fimbristylis œstivalis	
94 Aroideæ	Cryptocoryne Roxburghii	
,,	Arisæma Murrayii	Sámpacha 'khánda, *i.e.* "snake-root." Cobra Lily.
,,	Amorphophallus campanulatus.	Suran.
,,	Remusatia vivipara	Rokh-álu. Wild Caladium.
95 Lemnaceæ	Lemna trisulca	Duck-weed.
,,	,, globosa	
	DIVISION B.—CELLULARES.—(*Plants with cellular tissue only*).	
	CLASS I.—FOLIACEÆ.—(*Leafy plants*).	
96 Filices (Ferns)	Polybotrya appendiculata.	Only one specimen of this fern is known to have been found at Matheran. It has for many years been in the garden at "Underwood."
,,	Acrostichum variabile, *Syn.* Gymnopteris variabilis, *var.* lanceolata. *Herb. Co.*	
,,	,, virens. *Syn.* Pæcilopteris terminaris, and Gymnopteris subcrenata.	Rooting fern. Once plentiful on several favourite sites at Matheran. Now almost exterminated by fern hunters.
,,	Asplenium planicaule. *Syn.* A. laciniatum.	
,,	,, radiatum, *Syn.* Actiniopteris radiata.	Palm fern. Khandála Ghát, on Mahableshwar road.
,,	,, falcatum	
,,	,, lunulatum, *var.* trapeziforme.	

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
96 Filices (*contd.*)	Pteris aquilina* *Herb. Co*	Netsa. Brake fern.
,, ...	,, quadriaurita, *Herb. Co.*	
,, ...	,, pellucida	
,, ...	Adiantum lunulatum, *Herb. Co.*	Hansraj, Rajhans, *i.e.*, "Goose foot" fern. Maiden-hair fern.
,, ...	,, capillus Veneris.	On wet rocks, near Panchgani. (Cooke).
,, ...	Cheilanthes farinosa, *Herb. Co.*	Pátkuri. Silver fern.
,, ...	Osmunda regalis, *Herb. Co.*	Nadicha Múrúd. Below the lake, Mahableshwar, and at Lingmala.
,, ...	Lygodium pinnatifidum, *Syn.* L. flexuosum.	Hansráj-vel. Creeping fern.
,, ...	Sagenia coadunata. *Syn.* Aspidium cicutarium, *Herb. Co.*	Kájáryache Bashing. Indian Beech fern.
,, ...	Polypodium quercifolium, *Syn.* Drynaria quercifolia.	Kádik-pán. Indian Oak fern.
,, ...	Nephrodium molle, *Herb. Co.*	
,, ...	Pleopeltis membranacea, *Herb. Co.*	
,, ...	,, linearis, *Syn.* P. Wightiana, *Herb. Co.*	
,, ...	Lastrea filix mas, *var.* cochleata *Herb. Co.*	
,, ...	,, filix mas, *var.* elongata, *Herb. Co.*	Male fern.
,, ...	Athyrium filix fæmina, *var.* flabellulata, *Herb. Co.*	Lady fern.
97 Lycopodineæ (Club-mosses.)	Lycopodium imbricatum...	
	CLASS II.—APHYLLÆ—(*Leafless plants.*)	
98 Musci (Mosses) ...	Hypnum curratum.	
,, ...	,, squarrosum.	
,, ...	,, bryoides.	
,, ...	,, reflexum.	
99 Fungi	Agaricus campestris.	Alamben. Mushroom.
,, ...	Lycoperdon pratense	Bhuiphod. Puff ball.
,, ...	Dædalia gibbosa..........	Kerambi, Páranza.
,, ...	,, versicolor	
,, ...	Polyporus giganteus	
,, ...	Anisogonium esculentum..	Common on the Yenna, Mahableshwar.
,, ...	Leucostegia immersa	

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* The brake fern grows in great profusion all over Mahableshwar. At Matheran it is now confined to a single site on the Garbet Ridge. No plants are now to be found on a site near little Chauk Point, where it grew a few years ago.

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NOTE ON THE FLORA OF MAHABLESHWAR AND MATHERAN.

By Theodore Cooke, LL.D. F.G.S.

An observant visitor to Matheran cannot fail to be struck with the way in which certain plants disappear as he ascends the hill from Narel. The Teak tree (*Tectona grandis*), the skeleton of whose dried leaves is so like lace-work, disappears before half the ascent is accomplished. The *Sterculia urens,* which looks as if its bark had been stripped off, and which is a very conspicuous tree along the ascent, also disappears, as well as the *Phyllanthus Emblica,* whose gooseberry-like fruit is used by the natives for pickling. On Matheran hill itself, many plants are met with which are not found on the plains below; and as we ascend to a still higher elevation and reach the table-land of Mahableshwar, 2,000 feet above that of Matheran, we find the effect of increased elevation in the gradual thinning out of certain plants, and the appearance of new ones. This is particularly noticeable on the ascent from the Koyna Valley, which is about 1,500 feet below the table-land of Mahableshwar ; as the paths, by several of which the ascent may be accomplished, pass along well-wooded slopes.

Ascending from the Koyna, the valuable Ain tree (*Terminalia tomentosa*) is very soon lost to view, and the only representative of the family (Combretaceæ) on the hill summit is the *Terminalia chebula,* which supplies the Myrobolans so largely exported for the tannin they contain.

In the same way the *Grewia microcos* and the *Wrightia tinctoria* disappear, the former very soon, while the latter is carried up very near to the plateau on the Ghát Road, near the small village of Metala. The *Casearia graveolens* may be found still higher up, but does not reach the summit, though it grows luxuriantly along the Ghát Road, not very far below Bombay Point, while the *Albizzia stipulata,* which is such a conspicuous tree at Matheran, with its dark, reddish-brown, papery pods, and its large, pinkish, brush-like flowers, ceases abruptly on the Fitzgerald Ghát Road, about 4 miles from Mahableshwar.

Looking through the list, so carefully and laboriously prepared by Mr. Justice Birdwood, I would make the following remarks :—

The *Reinwardtia trigyna,* which, in the introductory note to the Catalogue, is said to have been found truly wild on Varandha Ghát, I have found wild in the Koyna Valley; at least I have found it growing luxuriantly in a dense jungle near the Koyna, in a locality far removed from any human habitations. The *Brugmansia candida* is not indigenous. It is, I believe, a native of Peru, but it has found the climate and soil of Mahableshwar well suited to its development, as it grows most luxuriantly over the hill, and has been planted along the Fitzgerald Ghát Road. Its large, white, funnel-like flowers render it a very conspicuous object.

The *Clematis Wightiana* is not, as far as I know, found at Matheran, nor does it extend much below the summit of Mahableshwar. Its flowers are large and yellow, but as it flowers in January and February, when the hill is not much frequented, its blossoms are rarely seen. The plants in Orders 2 and 3 do not occur at Mahableshwar; the *Cocculus macrocarpus* does not quite reach the hill summit, though it may be found just below the Dhobi's Fall. *Polygala persicariæfolia* does not, I think, occur at Matheran, and indeed, is rare at Mahableshwar. It may be met with on the path leading from Lingmala Ravine towards the Waterfall. *Ancistrocladus Heyneanus*, though tolerably common at Matheran, does not reach Mahableshwar; nor do the plants of the Order Guttiferæ, immediately preceding. Of the Malvaceæ, neither *Hibiscus hirtus*, *Thespesia Lampas*, nor the *Bomax*, and of the Sterculiaceæ, none of the plants catalogued are to be found at Mahableshwar. The *Triumfetta rhomboidea* is tolerably common, the *Elæocarpus oblongus* rare. There is a good tree of the latter in Lingmala garden, and a couple on the bank of the stream below the house. There is also a solitary tree in the compound of Prospect Cottage, at the corner of the Cross Road, just opposite the entrance gate of Temple Hall. Many of the leaves of this tree turn red, which render it a conspicuous object among the foliage of the woods, and the fringed petals of its flowers are very beautiful, the brownish-red calyx appearing through the interspaces between the petals. All the plants catalogued under the genus *Impatiens* are to be found at Mahableshwar, among them a very remarkable one, a yellow balsam (*I. Dalzellii*). *Evodia Roxburghiana* does not occur at Matheran, and is somewhat rare at Mahableshwar. One tree (a male) may be found on the Panchgani Road, a few yards beyond the turn to Kate's Point. There is another tree at the 4th culvert on the Fitzgerald Ghát Road, and a little further down the road, close to a culvert, are two trees, a male and female. A knowledge of some localities where a tolerably rare plant may be found, will be useful to collectors. Neither of the Orders BURSERACEÆ nor MELIACEÆ are represented on Mahableshwar.

The *Mappia fœtida* is a very remarkable as well as common tree at Mahableshwar. I do not think it occurs at Matheran. The odour of its yellowish flowers, which appear in October, is most offensive, savouring of carrion. Visitors to the hill are often puzzled by the strange odour, and unable to account for it. There is a tree in the Superintendent's compound, at the side nearest the Club, and several trees may be found close to the road, just below the Bund. *Zizyphus rugosa* is common both at Matheran and Mahableshwar, and its white berries are edible, though not very palatable. *Zizyphus xylopyrus* does not occur at Mahableshwar, while the *Scutia indica* is only found on the higher Gháts, and does not descend to the level of Matheran. It is known at Mahableshwar as the "Wait-a-bit thorn," as when its hooked-thorns catch the clothes of a rambler through the woods, there is no going forward till the thorns are unhooked,—often a difficult process. It may be easily identified by its native name "Chimat."

Hemigyrosa canescens does not ascend to Mahableshwar, nor does *Schleichera trijuga*, but the Order (SAPINDACEÆ) is abundantly represented by the shrub *Allophylus Cobbe*, which, with its soft, trifolate leaves and long racemes of small, white flowers, is scattered everywhere over the hill top. The LEGUMINOSÆ are largely represented on both hills, but it is a remarkable fact that, while in Matheran, there are several *trees* belonging to the Order, there is not a single tree on Mahableshwar belonging to it. The *Crotolarias, Smithias, Desmodium, Phaseolus, Vigna, Atylosia, Cylista,* and *Flemingia* are common to both hills; but the only Acacia on the summit of Mahableshwar is *Acacia Intsia*.

Of the ROSACEÆ, the *Rubus lasiocarpus* or Mahableshwar Raspberry is very common and well-known. This plant is indigenous here and to the highest Ghâts to the Southward. *Rubus moluccanus* has been found at Mahableshwar, but it is very rare. It may be found in a ravine on the road to old Mahableshwar. I found it very abundantly on the high land (Newera Eliya) in Ceylon.

Of the RUBIACEÆ, neither *Adina* nor *Stephegyne* occur at Mahableshwar, the *Wendlandia notoniana* does not occur at Matheran; and I have only seen it in Mahableshwar, near the banks of the stream (Yenna) below Lingmala. *Psychotria truncata* is a rare plant, occurring as far as I know, at Mahableshwar, in a single locality, which being far removed from habitations and in a dense jungle, it is difficult to describe. *Mussænda frondosa* does not ascend to Mahableshwar, though common at Matheran and in the Koyna Valley, where its velvety, orange flowers and curious, white, leaf-like bracts may be seen throughout the woods. Most of the COMPOSITÆ are common to both hills, but *Elephantopus scaber* does not ascend to Mahableshwar, though plentiful at Matheran and in the Koyna Valley, and the same may be said of *Cyathocline lyrata,* while I do not know that *Adenostemma viscosum* or *Adenoon indicum* have been found at Matheran, though common at the higher elevation. The commonest Composite at Mahableshwar, scattered all over the hill with the brake-fern, is *Conyza stricta.*

Of the CAMPANULACEÆ, the little *Wahlenbergia gracilis* does not grow at a low elevation. It is not found at Matheran and is very rare at Mahableshwar, the elevation being apparently insufficient, for at the high elevation of Newera Elliya, Ceylon, it grows very abundantly.

The *Sideroxylon tomentosum* which is verya bundant at Matheran, does not seem to thrive at Mahableshwar. It is nowhere found near the central portion of the hill top, and is confined to its edges. It is to be met with on the path-way up to Lodwick Point, and also occurs near Bombay Point. Neither *Bassia latifolia* nor *Mimusops Elengi* occur at Mahableshwar, while the Order EBENACEÆ does not possess a single representative.

Symplocos Beddomei is not met with at Matheran, but is tolerably plentiful at Mahableshwar. It flowers in the cold season; its blossoms have the odour of the hawthorn, and its berries, which ripen in May, are blue. There are one or two trees just opposite the gate of the Cemetery. The *Jasminium arborescens* is common to both hills, and its fragrant white flowers are seen in great profusion in April. The *Olea dioica,* which is very common at Matheran, is rarely met with in the Mahableshwar woods, while the *Ligustrum neilgherryense* is very common on the latter hill, and does not occur at all on the former. Its fragrant white flowers appear abundantly in October. Of the APOCYNACEÆ there is but one representative on the Mahableshwar hill, and that is a rare plant, the *Rauwolfia densiflora.* It may be found in the ravine below the Forest Officer's bungalow at Lingmala. Its white flowers appear in April. Of the ASCLEPIADS, the *Calotropis gigantea* does not ascend to the elevation of Mahableshwar. The most remarkable plant of the Order which occurs there is the

Gymnema sylvestre, which is an extensive climber, with small yellow flowers, appearing in the hot weather. The leaves of this plant, when chewed, possess the strange property of destroying for a time the taste for sugar, while exercising no effect on the taste for substances other than saccharine. If two or three leaves be chewed and the tongue and palate moistened with the juice, the result of taking a little sugar in the mouth is very curious. It appears just like so much sand, while salt or anything not saccharine tastes just as usual.

Of the LOGANIACEÆ, the *Buddleia asiatica* is the only plant of the Order at Mahableshwar. It is very rare. There is one plant at Lingmala, near the out-houses of the bungalow, and I have seen a plant on the Fitzgerald Ghát. Of the GENTIANS, the little purple *Exacum Lawii* is all over the Mahableshwar hill, in October, amongst the grass, but dies very soon after the rains cease. The *Swertia decussata* is found at Mahableshwar occasionally, but not common there. It is very abundant on the hill top above the Panchgani travellers' bungalow. An infusion of this plant is used by the natives as a febrifuge.

The Order BORAGINEÆ is represented on both hills by the genus *Paracaryum*.

The *Paracaryum cœlestinum* is known as the Mahableshwar "Forget-me-not." It is very abundant both here and at Matheran.

Two other *Paracaryums* are tolerably common at Mahableshwar, but as far as I know, do not occur at Matheran. The *P. malabaricum* is the more common, and may be found in large quantities at the Bund. *P. Lambertianum* may be found on the cliff, opposite the Dhobi's Waterfall, below General Barr's bungalow. Of the SOLANACEÆ, the *Solanum giganteum* is very abundant at Mahableshwar, but does not, as far as I recollect, occur at Matheran. It is to be found everywhere on the former hill, and its bunches of red berries are handsome.

The *Heterophragma Roxburghii*, which is very common at Matheran, does not seem to thrive at Mahableshwar. I only know of two trees at the latter place, and these are poor stunted specimens. One of them is just over the Yenna Waterfall, and the other a few yards beyond the 30th mile on the Satara Road.

Of the ACANTHACEÆ, *Thunbergia fragrans* may be found all along the Panchgani Ghát, and on the road from Panchgani to Mahableshwar, but, strange to say, it ceases at the 68th mile, half way between these stations. It is somewhat remarkable that it does not extend to Mahableshwar itself, as it is very abundant at the high elevation of Newera Elliya, Ceylon. The term *fragrans* is a misnomer, as its flowers are destitute of fragrance.

Of the Barlerias, *B. Prionitis* with yellow flowers is very common on the road up to Matheran, but does not occur anywhere near Mahableshwar. *Barleria strigosa,* with large blue flowers, is common at Matheran, where it may be found in abundance below Ponsonby's Spring, but is only to be found on the slopes of Mahableshwar and not on the hill top. It may be seen in flower in the cold season, on the slope some way down below the Dhobi's Glen. *Ecbolium Linneanum,* which is very common at Matheran, and has green flowers, is not found at Mahableshwar; nor is the magnificent *Calacanthus Dalzelliana,* which grows in profusion on the wet rocks on the road up to Matheran, about a mile below the *Chauki.* Of the Verbenaceæ, the *Callicarpa lanata* is common to both hills, the *Tectona grandis* does not reach even half way up the ascent to Matheran, and the *Premna coriacea* and *Gmelina arborea* do not grow at Mahableshwar. *Vitex negundo* will no doubt flourish on either hill; it has been largely planted along the Fitzgerald Ghát, and *Vitex leucoxylon* is to be found in the Koyna Valley. The *Clerodendron serratum* is not found on Matheran, nor on Mahableshwar hilltop, but it may be found about Lingmala Ravine and on the Panchgani Road; it also occurs on the slope below Bombay Point on the road to the Koyna. The most common of the Labiatæ, both at Matheran and Mahableshwar, is *Leucas stelligera.* At Mahableshwar, another member of the genus occurs, *Leucas ciliata,* a larger and much less common plant than *L. stelligera. Dysophylla myosuroides* is not found at Matheran, but is common in Mahableshwar water-courses. It is abundant in the *nulla* near the Sassoon Point Tennis Court, just below where the road from the bazaar crosses the stream. *Micromeria Malcolmiana* is a small plant peculiar to Mahableshwar. It is found along the Yenna, below the Bund, and has a strong odour of peppermint.

The *Plantago major* is rare at Mahableshwar, and is not found at Matheran. It may be found on the banks of the Yenna River.

The *Lasiosiphon eriocephalus* is common to both hills, and is particularly abundant at Mahableshwar. The handsome climbing shrub *Elæagnus latifolia,* the under-sides of whose leaves have a sheen like silver, and whose pink coloured fruit is edible, is also common to both hills. Of the LORANTHUS family, I have not found either *L. involucratus* nor. *L. lageniferus* at Mahableshwar. The *Osyris arborea* is not found at Matheran, although growing at Khandalla, which is close by. It can be readily identified by its native name "Lotal." The Order EUPHORBIACEÆ is better represented at Matheran than at Mahableshwar. The Crotons are entirely absent from Mahableshwar; *Flüggea leucopyrus* ascends about half way up the hill from the Koyna and then ceases; while of the three trees, *Phyllanthus lanceolarius, Briedelia retusa* and *Macaranga Roxburghii*, the first only occurs in any quantity in Mahableshwar. Though the *Briedelia* does occur in one place, the top of the old Rotunda Ghát, below Bombay Point, it does not, as far as I know, occur anywhere else, and should therefore be hardly considered a Mahableshwar tree. The *Macaranga* does not grow at Mahableshwar at all, but the Bhoma (*Phyllanthus lanceolarius*) (*Syn. Glochidion lanceolarium*) is very abundant. *Homnoia riparia* is to be found in beds of streams at Mahableshwar, not at Matheran, and may be collected in the bed of the ravine below the Dhobi's Waterfall. Of the URTICACEÆ, *Gerardina heterophylla*, a formidable stinging nettle, is common to both hills, as are also the *Splitgerbera scabrella*, and the *Trema Wightii*. *Fleurya interrupta* is not found at Mahableshwar, nor is *Debrigascea longifolia*, a native of Matheran. *Ficus glomerata* (Umbar) is common on both hills, but none other of the genus *Ficus* is to be found on the hill-top of Mahableshwar, except *Ficus caricaoides*, although *F. asperima*, *F. cordifolia* and *F. infectoria* may be met on the slopes. The *Artocarpus integrifolia* does not reach Mahableshwar; it is cultivated near villages in the Koyna Valley, and there is one tree at the village of Metala on the plateau below Bombay Point.

The *Salix tetrasperma* or Indian Willow does not grow at Matheran; it is abundant along the Yenna River and may be seen in flower in October.

With regard to the ORCHIDACEÆ, the handsomest one at Mahableshwar is the *Ærides Lindleyanum*, which does not occur at Matheran, and the most showy one at Matheran is *Ærides maculosum*, which is not found at Mahableshwar, though it is seen on the Panchgani Road. The *Dendrobium barbatulum* is common to both hills, and is in flower in March and April. *Dendrobium ramosissimum* is not found on the summit of either hill. It is very abundant in the Koyna Valley. *Dendrobium Macræi*, a curious looking orchid with many large pseudo bulbs, and a single leaf growing out of the terminal one, is very rare at Mahableshwar, and is not to be found at Matheran. It is very abundant in the Koyna Valley, some of the old trees along the river being literally covered with this, *Dendrobium ramosissimum* and the bulbs of the *Cirrhopetalum fimbriatum*. A visit to the Koyna Valley will amply repay a plant-hunter. The ferns and orchids in some parts near the river are in the greatest profusion, and must be seen to be appreciated.

Of the two hills, Matheran and Mahableshwar, the former has the more varied flora, but several plants are found in Mahableshwar which do not exist at the lower elevation of Matheran. I have made a rough estimate, which is not correct to a dozen plants or so, that there are about 140 plants (excluding grasses) which occur at Matheran, and which do not occur at Mahableshwar, and that there are about 130 plants which are found at Mahableshwar, and not on Matheran, while there are perhaps 140 common to both hills.

I regret that I have not had longer time to devote to this short note, which has been written hurriedly, in order to be in time for the issue of the Journal in which Mr. Birdwood's Catalogue is to appear.

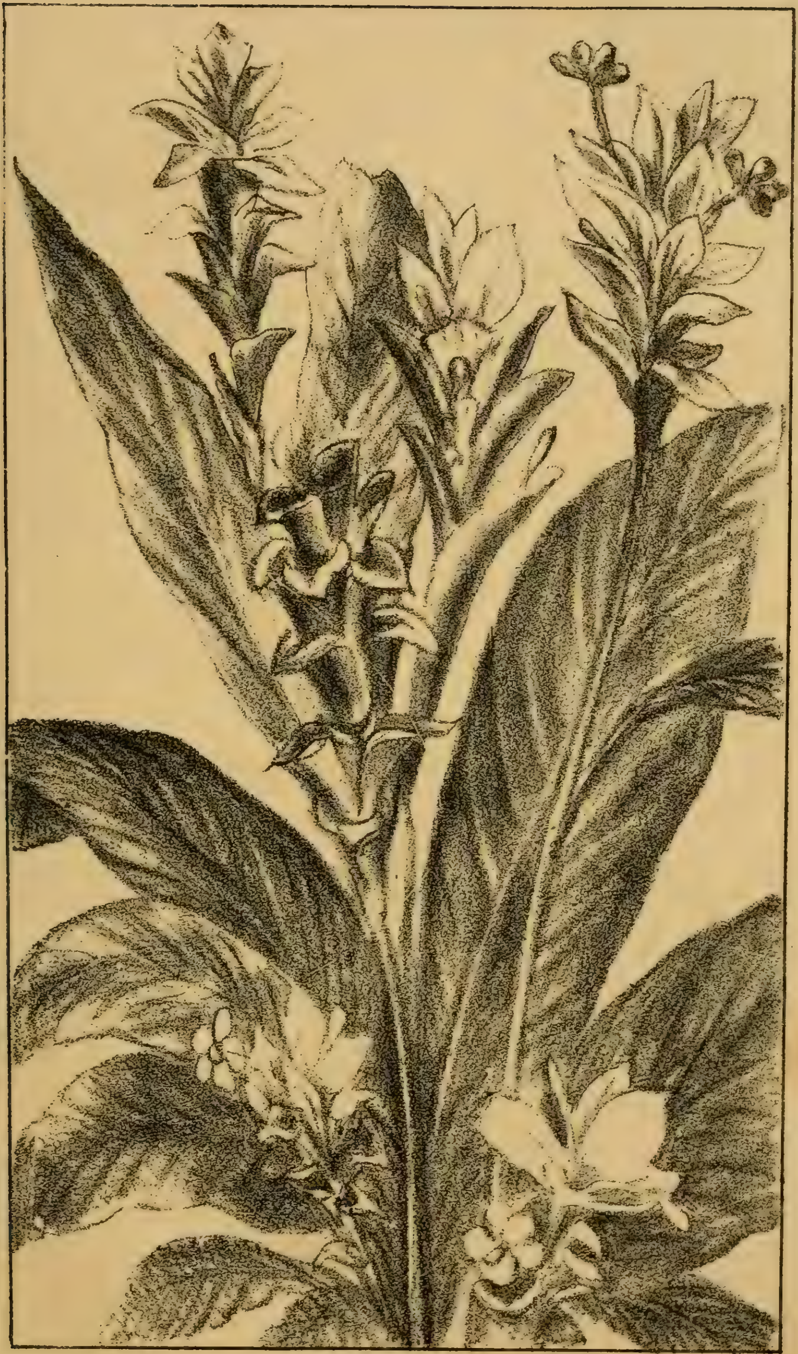
T. COOKE.

Mahableshwar, April 26th, 1887.

NOTES ON MAHABLESHWAR AND OTHER INDIAN ARROWROOT-YIELDING PLANTS.

BY DR. J. C. LISBOA.

There appeared, two years ago, in one of our local papers a short article in which it was sought to prove that there is no arrowroot plant indigenous to Mahableshwar, and a correspondent even attempted to show that a arrowroot prepared there is from *Maranta arundinacea*, carried from Rutnagherry to the hill and there cultivated. There is, however, no doubt, that the arrowroot prepared at Mahableshwar is from the tubers of a plant indigenous to that hill, first described by the late Mr. Graham, of the Bombay Civil Service, and as yet not found anywhere else so far as I know. The plant is *Curcuma caulina*, Nat. Ord. Scitamineaæ, Grah. Cat. Bomb. Pl. It is very common at Mahableshwar, where it is known to the natives



CURCUMA CAULINA.

as Chowar. It may be described thus:—Root size of an orange, sometimes larger, with large oblong tubers, white inside, pendulous from the fibers. Radical leaves almost opposite, sheathing, short-petioled, oblong lanceolate, 12-20 by 3-4 in., upper leaves alternate frequently tinged with a beautiful red; scape central leafy, 3 feet high. Bracts green, calyx white, and corolla yellow.

It is from the roots of this curcuma that the Chinese ticket-of-leave men and a native of Goa, Mr. DeCosta, for many years used to manufacture arrowroot and sell it to the Commissariat and in the bazaars of Bombay. Dr. McConaghy says that, in 1878, a European prepared a few hundred pounds of it and sent samples to be tried by Messrs. Treacher and Co., Phillips and Co., and Kemp and Co. Its colour and taste were pronounced good, but it was found to be deficient in nutritive properties. That it is inferior to West-Indian arrowroot may be gathered from its market value, 5 to 6 lbs. to the rupee. During the famine of 1877, it was recommended to the suffering poor, but they never used it except in extreme scarcity.

The process of preparing arrowroot at Mahableshwar is simple. The root (of which a cooly will gather four or five large basketsful a day, for as many annas) is scraped, washed and rubbed to pulp on a grater, as mortars are found to crush the globules. The pulp is then washed with cold water, and the fecula allowed about ten or twelve hours to settle; the supernatant fluid is then decanted, the sediment stirred with the addition of fresh water and again allowed to settle. The whole process is repeated above twelve times, till the dark scum and the muddiness of the washings slowly disappear and the sediment is pure white, when it is allowed to harden into a cake, which is afterwards reduced to powder. A basketful of roots yields 3—4lbs. of pure arrowroot. *Curcuma caulina* flowers at about the end of September. I had planted in pots during the last monsoon tubers which I had brought from Mahableshwar, and with which I intended to illustrate my paper, which was meant to be read at the last October meeting. Having, however, been informed by the Honorary Secretary that the Society had resolved to hold, as it did, a fruit exhibition that month, I left Bombay soon after, and my plants had withered when I returned in the early part of December.

The arrowroot, a specimen of which I have exhibited though made in a rough manner, is white, and like other kinds of arrowroot insipid and inodorous. Examined under the microscope in a drop of water, it is found to consist of numerous granules of various sizes, somewhat resembling those of *maranta* and *tickar.* They may be described as flat, somewhat irregular broadly ovoid bodies, round at the larger end, and narrow, almost drawn to a point, at the other, with a beautiful stratification, consisting of fine concentric lines around the hilum, which is visible towards the narrow end. To ascertain the proportion of nutriment principles of this arrowroot, a thorough analysis by a competent chemist is a desideratum. So far as my enquiries go, no such analysis has been made.

I am led to believe that arrowroot was obtained by a rough process by the hill men, long before the Chinese ticket-of-leave men manufactured it; and is still obtained by the inhabitants of the hill from the plant, which grows all over. It is now being manufactured at Gutad, about 3 miles from Frere Hall, and sold chiefly to natives, hence it cannot be of a very inferior kind, as stated by Dr. McConaghy. I shall now proceed to describe other Indian plants which yield various kinds of arrowroot. The best arrowroot is that which is prepared from the rhizome of *Maranta arundinacea,* Rosc. Scitam, tab. 25, a herbaceous plant, native of the tropical parts of America, and of the West India Islands. A variety of it, named *M. Indica* Tussac, Rosc. Scitam tab. 26, occurs in Bengal, Java and the Philippines, considered by Grisebach in his Flora of the British West-Indian Islands to be a species distinct from *M. arundinacea.* It is said that the arrowroot cultivated at first in Brazil, was from the rhizomes carried thither from India by the Portuguese.

The chief kinds of arrowroot, the produce of *Maranta,* are from Bermuda, Natal, St. Vincent, Jamaica and other West India Islands, Brazil and the East Indies. The latter is prepared from the tuber of *M. Indica* above mentioned, and sold pure or mixed with *Tickar* Arrowroot, presently to be mentioned. *Maranta arundinancea* is extensively cultivated at Dapoli in Rutnagherry, by Mr. Narayen Ramchandra Gupte. The Commissariat Department lately gave him the contract for 1886-87 for the supply of arrowroot to the several military stations in the Bombay Presidency. The total amount required at these stations in 1886-87 was about 5,000lbs. Mr. Gupte will have to supply this quantity of arrowroot at the rate of 4¼ annas per pound. It may be stated here that this arrowroot on examination, both microscopic and chemical, proves to be fully equal to the Bermuda arrowroot. It is also cultivated by Mr. Woodrow, of the Poona College of Science; the produce is stated to be at the rate of 9 tons of fresh root per acre. When manufactured by unskilled hands this gives 2,822·4lbs., or 14 per cent. of pure arrowroot per acre. One of the agricultural students, Mr. R. S. Joshi, has lately invented a wooden machine which reduces the cost of preparing arrowroot by almost 8 per cent. The machine is still capable of great improvement, but its chief merit is that any village carpenter can make it.

Arrowroot of all kinds is a favourite article of diet among the natives, especially for children. The milk-men in Bombay use it to thicken milk which has been watered.—Dymock. *Curcuma angustifolia.* Roxb. *Tavakhir?* (Bomb.) *Tickar* (Hind.)— This is an annual plant, springing up at the beginning of the rains. Bulbs with oblong tubers hanging from the fibres. Leaves narrow, lanceolate, petioled, striated, with fine longitudinal lines, from one to two-and-a-half feet long; petioles, 6-10 inch long; spike radical, 4-6 inch long; crowned with a coma of purple bracts; flowers yellow, large, expanding in the morning and fading at sunset.

It grows wild in various parts of India, Travancore, Nagpore, &c. and in the Bombay Presidency at Ramghat. This species is said to yield portion of what is called Travancore arrowroot. There is no doubt that Curcuma arrowroot (known in Bombay as *Tavakhir*, *tickar* in the other presidencies, and to Europeans as East Indian arrowroot) is manufactured in Southern India especially in Cochin, Travancore and Kanara, but in a very rude manner, the granules much resembling those of *Maranta arundinacea*; in fact what is called tickar arrowroot is often the produce of the latter plant, or curcuma starch mixed with that of cassava or tapioca plant, the manhihot being much cultivated at Travancore. Malabar arrowroot fetches from Rs. 3 to Rs. 4 per quarter cwt. in Bombay. Drury (useful plants of India, p. 176) says:—"An excellent kind of arrowroot is prepared from the tuber of this species (*C. angustifolia*), especially in Travancore, where the plant grows in great abundance." This is a favourite article of diet among the natives. The flour, when finely powdered and boiled in milk, is an excellent diet for sick people or children. It is also much used for cakes, puddings, &c. though considered by some to produce constipation. In a commercial point of view the East Indian arrowroot is below the West Indian starch, though similar in its qualities and uses. The exports of arrowroot from Travancore average about 250 candies annually."

It appears that in 1869-70, 3272 cwts., valued at Rs. 14,152 were exported from Madras. Drs. Roxburgh and O'Shaughnessy state that *C. rubescens,* Roxb. Rosc. Scitam tab. 107, which grows in Bengal and is there named *tickar* also yields nutritious fecula. Every part, particularly the root, has a strong but pleasant aromatic odour when bruised; but its chief use is for the preparation of tickar, a fine fecula like arrowroot. *C. leucorrhiza,* Roxb. Rosc. Scitam tab. 102, also named *tickar,* is common in Behar; its horizontal tubers, long and straight, are of a very pale yellow colour; they also yield an abundance of fine nutritious fecula used by the people of Behar and Bhagalpore. Dr. Royle says:—"The pendulous tubers of *Curcuma rubescens, C. leucorrhiza* and *C. angustifolia* yield a very beautiful fecula or starch, which forms an excellent substitute for the West Indian arrowroot, *Maranta arundinacea.* It is sold in the bazaars of Benares, Chittagong, and Travancore, and eaten by the natives. A very excellent kind called *tickar* is also made at Patna and Bagilpore from the tubers of *Batatas* (*Ipomœa*) *edulis.*"

The mode of preparing arrowroot at Travancore is as follows:—"The tubers are first scraped on a rough stick, generally part of the stem of the common rattan or any plant with rough prickles to serve the same purpose. Thus pulverised, the flour is thrown into a chatty of water, where it is kept for about two hours, all impurities being carefully removed from the surface. It is then taken out and again put into fresh water, and so on for the space of four or five days. The flour is ascertained to have lost its bitter taste, when a yellowish tinge is communicated to the water, the whole being stirred up, again strained through a piece of coarse cloth and put in the sun to dry. It is then ready for use."—Drury. The process adopted at Behar and Bhagalpore is as follows:—The root of *C. leucorrhiza* is dug up and rubbed on a stone or beaten in a mortar, and afterwards rubbed in water with the hand and strained through a cloth; the fecula having subsided, the water is poured off and the *tickar* dried for use.—Roxb.

C. pseudo-montana, Grah. Cat. Bomb. Pl. *Sinderwani*; *sinderbur*; *sindewan*; *helleunda.* Bulb oblong, with round, small, potato-like tubers, hanging from the fibres. Leaves, including the petiole 2-3 feet long, narrow at both ends, 6-19 inch broad in the middle, quite green. Coma of a beautiful dark rose colour, waved. Flowers yellow, appear in September.

This plant, which was first described by Mr. J. Graham of the Bombay Civil Service, is common in the Konkan, Matheran, &c., where it appears at the beginning of the rainy season. The tubers, which are perfectly white inside, are boiled and eaten by the people during seasons of scarcity. Perhaps, this plant too, yields a part of East Indian arrowroot; for it is stated that in former times, it was manufactured at Ratnagherry from its tubers. (See specimens on the table prepared in Ratnagherry and North-West provinces.) All the plants described above belong to the Nat. Ord. Scitamineæ.

Arisæma tortuosum, var. *helleborifolium*, Schott Syn. Ar. 29; Prodr. 36; Blume in Rumphia 1-105. *Sap Kanda* (Khandala name). This belongs to the Nat. Ord. Aroideœ and is met with at Matheran, Khandala, and other Konkan hills, as well as in the Himalayas, at Simla, Nepal, Sikkim and Mussooree. In the observations appended to the plate 5931 in Curtis' Bot. Mag., Sir J. D. Hooker says that "the tuberous roots of this and allied species of *Arisæma* are used for food in times of scarcity by the Lipchas of Sikkim; they are prepared by burying them in masses in the ground, until acetous fermentation sets in, when they are dug up, washed and cooked. By this means the poisonous properties of the roots are in part destroyed, but not altogether, and violent illness often follows a hearty meal of 'tong' as this food is called. The nutritious starch, with which these tubers are filled, might be easily separated by grating and washing and an aliment as good as Portland island arrowroot (the starch of *Arum maculatum*) be thus procured in quantities." Though the tuber of this aroid is utilized as food by the Lipchas of Sikkim, it does not appear to be used as such on this side.

The plant described under the name *Arisæma curvatum* by Sir J. D. Hooker in Curtis' Bot. Mag. tab. 5931, above alluded to, is in the opinion of Engher, Araceæ, D. C. Monogr. Phaneg, *Arisæma tortuosum* var. *helleborifolium*, an opinion which is adopted here. Sir J. D. Hooker himself appears to have had doubts about the identity of the species for after stating that it grows in the forests of the Himalayas from Bhootan to Simla, Nepal and the Kassia mountains at elevations of 5,000 to 7,000ft. says—a "similar if not identical species inhabits the mountains of the Konkan in the Peninsula of India."

Arisæma curvatum which is well described in Rox, Fl. Ind. vol. III. p. 506, and figured in Wight's Icon. tab. 788 under the name of *Arum curvatum* grows only at high elevations; and so far as it is known, on the Himalayas, Nepal, Naini-Tal and Kumaon; its lamina is pedatisect, leaflets 10-13, sessile, linear-lanceolate, 4-6 inch by $\frac{1}{4}$-$\frac{3}{4}$ inch approximate, accuminate, entire.

A. helleborifolium is a common plant in the Konkan, first described by the late Dr. Stocks, of the Bombay Medical Service, as well as on the Himalaya mountains, Nepal, and Sikkim discovered by Lady Dalhousie, Wallich and others. I have found it also at Khandalla and Matheran, where it is known to the natives as *sap khanda*. Its lamina is pedate, 6-12 inch diameter and orbicular in outline: leaflets 13-23, 4-8 inch by 2-3$\frac{1}{2}$ inch acute, accuminate or caudate at the pit, bright green; central distant and petioled, lateral becoming gradually smaller, shortly petioled or almost sessile.

In my book (Useful Plants of the Bombay Presidency, "Bombay Gazetteer," Vol. XXV. chap. Famine Plants) I have stated the following:—"Almost all the species belonging to the order *Aroideæ* are more or less acrid and poisonous; some, like *Lagenandra toxicaria*, *Vatsunab* of the Marathas, *Typhonium tribolatum*, *Surei Kanda* of the Telingas, &c., are deadly poisons. They contain an acrid principle which appears to be destroyed by the application of heat or by mere drying of the aroids. During the late famine in Madras and Southern Maratha country, hundreds of people were seen to live upon tuberous roots and leaves of aroids known to be poisonous. It is believed that the washing, boiling and stewing process these herbs were subjected to prior to being eaten destroyed their deleterious principle, and thus the tubers, &c., became innocuous or rather wholesome food. The cultivation is also held to modify the poison both in the case of aroids as in that of cucumbers. The *Soorun* (*Amorphophalus campanulatus*) which is widely cultivated for the sake of its large root held to be a very nutritious vegetable and extensively consumed by all classes of people of this country, also contains a principle, slightly acrid; this is removed by steeping the sliced tuber in water and by boiling. Nevertheless, not long ago a paper was read at one of the meetings of the Grant College Medical Society in which a case of poisoning marked by severe inflammation of the fauces and throat was described." There is in North America a species of *Arisæma* named *A. atrorubens*, of which Dr. Lindley says:—"It is violently acrid and almost caustic; the rhizome when fresh is too powerful to render its internal exhibition safe. The acrid principle is extremely volatile, and easily driven off by heat when the rhizome yields one-fourth of pure delicate amylaceous matter, -resembling the finest arrowroot, very white, delicate and nutritive.

Tacca pinnatifida, Roxb. Nat. Ord. Taccaceæ, known to the natives of the Deccan by the name of *khunda.*—It grows all over India and also in the Malayan Archipelago, the Molluccas and South Sea Islands, and is cultivated in the Mauritius. I found it very common at Damaun and the neighbouring villages of Guzerat. Its root is tuberous, as large as a large orange, often larger, round and smooth, intensely bitter when raw, it yields a great quantity of beautifully white starch, of which it is said the best flour for confectionery, puddings, &c., is made.' Drury says:—"The fecula much resembles arrowroot and is very nutritive." "It possesses a considerable degree of acrimony," says Ainslie, " and requires frequent washing in cold water previous to being dressed. In Travancore, where the root grows to a large size and is called *Channay Kelimgoo* it is much eaten by the natives, who mix some agreeable acids with it to subdue its natural pungency." In the notes appended to *Tacca artocarpifolia* T. 6124, Curtis' Bot. Mag. Sir J. D. Hooker states:—'The tubers of *Tacca pinnatifida* afford the South sea Arrowroot, said to be the best of all in cases of dysentery, and its starch is a favourite article of diet in the shape of puddings and cake. In times of scarcity, the inhabitants of these islands live on the fleshy tubers of *tacca.*"

ZOOLOGICAL NOTES.

HYBRID WOLF PRESENTED TO THE SOCIETY.—Mr. Frank Rose, the donor of this animal, writes concerning it:—

Apropos of Mr. Sterndale's "*Note on Reversion to Primitive types,*" giving a case of cross-breeding between jackals and dogs, I have much pleasure in presenting the Society with a *Hybrid* wolf-whelp—a cross between a village dog and a wolf, age about 3 months, caught in the 69th mileage, Chickli-Dewalgaon, Rajah Road, (Buldana Districts, Berar). The mother with five other wolves (*Canis pallipes*) and a *hybrid* are in the vicinity of *Javul-Kheira.*

The whelp was captured on 12th January, under the following circumstances: While examining a quarry about a mile from the road, a dog was observed going leisurely towards a flock of sheep; the latter grazing and looking unconcernedly at their apparent protector! But, alas! after a few minutes, an outcry from the shepherd was heard, when to our astonishment the carcass of a sheep was being triumphantly carried away by the wolves in fragments, the *Hybrid* "wolf dog," as he is called, acting as a pioneer (but without the dainty piece of mutton), heading the marauders. One of them made direct towards a bush, when the three whelps came out. Chase was given, and on seizing one it bit a man slightly, when it was soon despatched to its long home! The one now sent (1st February) also showed fight, and resisted his capture for a long time, but was soon coaxed, and secured; the third made its escape with its mother and her *confrères*. For the first three days (12 to 15th January) the pup seemed very unhappy, and sulky, but had a voracious appetite for raw meat. After a time he gradually became very tame, so much so that my children played with him. This may be considered rather an imprudent act, but he appeared so happy and contented in their arms, I concluded, that he had domestic blood in him like his noble grandfather, the village pariah! The whelp was under domestication for eighteen days.

From the same pack there were three *Hybrids*:—

No. 1—brought up by the special magistrate at Mahona—is now prowling about in that vicinity and Rajah-Dewalgaon, quite domesticated; she will not reside with her master or in one place; but goes roaming from one village to another in the vicinity, and does not associate with her parents. She has never been known to bite any one, but is said to be a renowned thief. I have always seen her escorted by an intrepid village cur, who seems to be quite delighted with her agreeable company, in having a charming wife of mixed parentage!

No. 2 was shot by a Mr. Burns of Berar, when capturing No. 3, early in 1886, at about the same place as I got mine.

No. 3 was quite a pet, but very mischievous with her thieving propensities. She frequently occupied a dark room during the day, and making her exit at nights, would steal clothes, hats, boots, &c., and deposit them in different bungalows. The poor thing was killed, wilfully I was told.

From the above facts, it is possible that within the next 25 years the wolves in this vicinity may in time become domesticated. The *first* Hybrid was known in 1885, I believe, and is the one now with the pack. Eminent Naturalists have decided that the anatomical structure of the wolf, its habits, and physical development are very closely allied to the dog; especially in its osteology, which does *not* at all differ. The only difference is in their oblique eyes. There can be no doubt that the dog and wolf will readily breed and their progeny prove fertile. The above will suffice as an instance in India. There is no gainsaying the fact, that they are mortal and irreconcilable foes, and poor doggie sometimes provides a dainty morsel to its supposed great grandparents; but yet they are known to follow domestic dogs in pursuit of smaller mammals. We are told that two species of the wolf, *Canis Lupus* and *C. latrans*—the latter known as the "*Coyote*"—("*Meesteh chaggonish*") or "Prairie wolf"—are the *originators* of *all* the canine species? Then why could they not breed and be made tameable and just as affectionate as our domestic dogs—*Canis familiaris*.

If I remember rightly, it is on record that a lady in Italy had a very tame and affectionate wolf, which followed her like a spaniel. Business took the lady from home for a few days, and on her return the wolf, through joy went up to her, put its paws on her shoulders, and immediately fell dead!

THE BUSH QUAIL (*Perdicula erythroryncha*).—The following letter about this bird has been received from Mr. W. Mahon Daly, of Yercand :—

It well known that the attachment of birds to their young is not exceeded by that of any other creatures.

The boldness and sagacity displayed the other day by a red-billed bush-quail (828 *Perdicula erythrorhyncha*) in the protection and defence of its brood, may not be uninteresting to your readers. A friend of mine caught in his hand a little one of this quail, and sitting silently under a bush watched for the mother. The chicken cried piteously for some few minutes, when, shortly the parent bird arrived, which seemed immediately to restore life to its frightened offspring. The bush quail repeatedly pecked at my friend's hand, and he in attempting to catch the bird took off a quantity of feathers. It came again and again, and seemed to peck at his hand beseechingly, rather than hurtfully, till at last it was caught a victim to maternal love. The mother having fairly won its little one was released, *and in a twinkling disappeared* with its "chick," and they were soon concealed in the long grass that this handsome bush-quail generally frequents.

These birds are generally met with in rocky ground with low scrub jungle, and nearly always in pairs, and not in large bevies as stated by Jerdon. An accurate observer has remarked that the natural timidity of birds is a great preservative to them. This quail however is most daring, for I have more than once seen it fly at a dog in defending its brood, and have often caught a bird off its nest, which contains generally six to eight eggs.

NOTE ON THE IRREGULAR BREEDING OF GRUS ANTIGONE, THE SARUS.

By Lieut. Edwin Barnes.

The normal breeding season of the Sarus is during the latter half of the monsoon, but that they frequently breed during the cold weather seems not to be generally known.

At page 6, "Game Birds of India," Mr. Hume gives the breeding season as above, but in a footnote, says:—"Occasionally, however, they certainly breed also in the spring." Quite recently, Mr. Chill wrote to me from near Delhi:—"Last month (April), my men brought me in a young Sarus, about twenty days old, so it must have been hatched about the end of *March*! It is a new thing to me to find the bird breeding in the spring."

On the 5th February last year (1885), while duck-shooting at Gangrar, about 60 miles from Neemuch, I found a nest containing two perfectly fresh eggs, and on the 30th March at Jeerun, about twelve miles from Neemuch, I found another pair, much incubated. This year (1886), on the 18th February, I obtained from a marsh, a few miles from Saugor, two more, very slightly incubated; these last eggs are perfectly white and spotless, and have a considerable amount of gloss, and my beaters assured me that this was the case with all Sarus's eggs in the Saugor District, but as is not unusual with native shikaries, they deviated from the truth, for the only two pairs of eggs that I obtained later in September, were fairly well marked.

A simple explanation of the cause of some few birds breeding in the spring might be that they are birds whose eggs have come to grief at the usual breeding season, and had in consequence laid again later on; but this theory is met by the fact, that eggs have been found, both by myself and others, in nests from which eggs had been taken two or three weeks previously, but it is not unlikely that they may be birds whose half-reared young have fallen victims to one of the many accidents to which they are liable. The young of the Sarus remain with their parents much longer than is usually the case with other birds.

The time at my disposal is very limited, and at most I can only get out for a few hours occasionally, and that three instances of this departure from the natural course should have fallen under my personal observation, seems to point to its being rather a common occurrence, but then, again, seeing that at this season of the year, the marshes and lakes frequented by these birds are almost daily shot over for snipe and duck, it does appear strange that such a prominent nest as that of the Sarus usually is, should escape notice, or it may be that the fact is so common that it fails to excite remark, although it appears to be unrecorded except in the note previously quoted.

COLLECTION OF BIRDS' EGGS.

PRESENTED TO THE SOCIETY BY MR. W. M. GIBBS.

No. of Specimens.	English Name.	Scientific Name.	Jerdon's No.
1	Indian King Vulture	Otogyps calvus	2
1	White-backed Vulture	Pseudogyps Bengalensis	5
2	Tawny Eagle	Aquila Vindhiana	29
2	Ring-tailed Sea Eagle	Haliaetus leucoryphus	42
18	Pariah Kite	Milvus govinda	56
7	Rock-horned Owl	Bubo Bengalensis	69
6	Spotted Owlet	Carine brama	76
3	Common Indian Bee-eater	Merops viridis	117
1	Common Indian Kingfisher	Alcedo Bengalensis	134
5	Rose-ringed Paroquet	Palaeornis torquatus	148
1	Rose-headed Paroquet	Palaeornis purpureus	149
1	Indian Koel	Eudynamis honorata	214
3	Purple Honey-sucker	Cinnyris Asiatiaca	234
4	Bay-backed Shrike	Lanius vittatus	260
3	Common Drongo Shrike	Buchanga atra	278
2	Rusty-breasted Fly-catcher	Siphia Erythaea	322
1	Bengal Babbler	Malacocercus terricolor	432
4	Large Grey Babbler	Malacocercus Malcolmi	436
5	Striated Bush Babbler	Chatarrhæa caudata	438
9	Common Madras Bulbul	Pycnonotus hæmorrhous	462
3	Indian Oriole	Oriolus Kundoo	470
2	Magpie Robin	Copsychus Saularis	475
1	Franklin's Wren Warbler	Prinia gracilis	536
1	Malabar Wren Warbler	Prinia Hodgsoni	538
23	Common Wren Warbler	Drymoipus inornata	543
2	The Jungle Wren Warbler	Drymoipus sylvaticus	545
3	Pied Wagtail	Motacilla Madraspatensis	589
7	Indian Corby	Corvus macrorhynchus	660
1	Common Indian Crow	Corvus splendens	663

No. of Specimens.	English Name.	Scientific Name.	Jerdon's No.
1	Common Indian Magpie	Dendrocitta rufa	674
1	Common Myna	Acridotheris tristis	684
1	Bank Myna	Acridotheris ginginianus	685
7	Common Weaver-bird	Ploceus Philippinus	694
2	Plain Brown Munia	Amadina Malabarica	703
2	Blue Rock Pigeon	Columba intermedia	788
3	Little Brown Dove	Turtur Senegalensis	794
6	Common Ring Dove	Turtur risorius	796
4	Common Sand Grouse	Pterocles exustus	802
4	Common Peacock	Pavo Cristatus	803
2	Grey Partridge	Ortygornis pondiceriana	822
7	Jungle Bush Quail	Perdicula Asiatica	826
4	Black-breasted Bustard Quail	Turnix taigoor	832
10	Red-wattled Lapwing	Lobivanellus Indicus	855
3	Yellow-wattled Lapwing	Lobipluvia Malabarica	856
4	Sarus Crane	Grus antigone	863
3	Bronze-winged Jacana	Parra Indica	900
9	Pheasant-tailed Jacana	Hydrophasianus chirurgus	901
2	Purple Coot	Porphyrio poliocephalus	902
2	White-breasted Water Hen	Erythra phoenicura	907
1	White-necked Stork	Dissura episcopa	920
1	Large Egret	Herodias alba	925
1	Little Egret	Herodias garzetta	927
4	Cattle Egret	Bubulcus Coromandus	929
1	Pond Heron	Ardeola Grayii	930
7	Pelican Ibis	Tantalus leucocephalus	938
2	Spoonbill	Platalea leucorodia	939
4	Shell Ibis	Anastomus oscitans	940
8	White Ibis	Ibis melanocephala	941
1	Flamingo	Phoenicopterus antiquorum	944
2	Black-backed Goose	Sarcidiornis melanonotus	950
1	Large River Tern	Sterna seena	985
2	Lesser Cormorant	Phalacocorax carbo	1006
14	Indian Snake Bird	Plotus melanogaster	1008

All the above were taken in the Kaira District with the exception of the Flamingo (Phoenicopterus antiquorum) which came from the Persian Gulf.

BOOK NOTICE.

The book under notice * refers to work done ten years ago, but was only published in England late in the year before last. Mr. Hornaday was commissioned by Professor Henry A. Ward, the proprietor of a great Taxidermical Establishment at Rochester, in the State of New York, to travel for two years in the East in search of fish, flesh and fowl; but chiefly of the larger mammals and reptiles. He started for Europe early in 1876; and is probably the only traveller of this generation who has produced a really readable account of a trip from a great European or American port to Bombay. He landed at Londonderry, and began his adven-

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* *Two Years in the Jungle*, the Experiences of a Hunter and Naturalist in India, Ceylon, the Malay Peninsula, and Borneo. By William T. Hornaday, Chief Taxidermist, U. S. National Museum; late Collector for Ward's Natural Science Establishment. London; Kegan Paul, Trench & Co. 1885.

tures among the giant mammals of the Old World by "skeletonizing four old donkeys" in the county Down; for which the finest pisanthry on a fruitful sod "came at him with longhandled spades" and "boycotted him in a cabin" till the siege was raised by H. M.'s Royal Irish Constabulary. The motives of his proceeding and of their resentment are obscure; unless we conceive that old donkeys are so rare in the State of New York, that a traveller can profitably spend money and time on their purchase and dissection; and that the patriots, on the other hand, considered the victims to be their own next-of-kin; and the slaughter to be good cause for a blood-feud. Anyhow Mr. Hornaday "came off with whole bones—mine I mean, not the donkey's," and upon the whole prefers Dyaks to Irishmen.

He got to Bombay after, as we have said, the only amusing trip thither of the last 20 years; and was disappointed with the contents of the Victoria Museum; but found the Crawford Markets a happy hunting ground; and arrived at the conclusion that there were "few marine animals in the neighbourhood of Bombay, except the fishes in the grand Market." Upon this head we feel justified in observing that Mr. Hornaday generalized from a very imperfect experience. He was a week in Bombay, and does not appear to have visited the neighbourhood of it at all.

His next halt was at Allahabad, whence he proceeded to Etawah and spent some time living in a boat on the Jumna and shooting gavials (*Gavialis gangeticus*), *i.e.* long-snouted fishing crocodiles there abundant, but not found in our local waters.

Our author had one great advantage over the ordinary sportsman, namely, that almost every creature that he saw was capable of being turned into the almighty dollar at Rochester, N. Y.; and he was therefore armed against the scorn with which old shikaris treat the griffin who has killed something that is "not shikar." If he didn't find a gavial any morning, he found a jackal, or a vulture, or a stork; anatomised him "straight away" and enjoyed immensely a trip which would probably have rather bored the sportsman of Philistia. He points out very well the peculiar charm of crocodile-shooting, which is that above all other forms of the chase it requires the use of straight powder; often under considerable difficulties and at long ranges. And, like a good many other people, he did *not* catch a river porpoise (*Platanista*) but he says he will do so yet.

After this he went out "into districts" with an Executive Engineer and his wife, and fell into the usual delusion of the globe trotter, that the life of a Mofussilite family under canvas is "a continuous picnic," which is of course based upon the not very recondite fact that his host and hostess did all they could to make it so to *him*. Picnics of this sort, however, are apt to pall a little upon the soul of him with whom they have been "continuous" for 20 years or so; and who has had to make them pleasant *for himself* in despite of the powers that sit in cool places.

Our picknickers, at any rate, introduced Mr. Hornaday to the black-buck, nilgai, and gazelle, and appear to have informed him that this last was "not found south of the Godavari," which shows that the Britisher can occasionally "ring in fun" even upon Professor Ward's young men: The Indian Gazelle (G. *Bennetti*) was to be seen every day near Poona, by any one with eyes in his head, at the time he wrote this, and is scattered all over the Deccan Districts and others, far southward, though nowhere so abundant as in parts of Khandesh and Gujarat.

The finest gazelle horns the present writer ever saw were reported by the owner to have come from near Kolhapur, and to be 16 inches long, and *looked it*; but were hung too high to be measured.

To return to our traveller. He went from Etawah to Calcutta without any adventure worth noting; except perhaps the pangs he seems to have felt at seeing seven score monkeys fed in Benares, whereof he might not skin so much as one: and a disappointment in the Taj Mahal of Agra. He got to Madras in the middle of the famine, and moralised quaintly upon the Relief operations. "The natives look upon the British occupancy of their country as a punishment inflicted upon them by the gods for past misdeeds * * * * *They had better pray for their gods to punish them some more in that way.*" He further approved highly of the Madras Museum, and especially of its stuffed fishes.

Madras, however, was no place for him, and he went, naturally enough, to the Nilgiris, where he found that "every prospect pleases, and only man is vile." He did, however, get introduced to the sambar, bison, and elephant at home, and thought that the last was "the most stupid animal he ever tried to approach." This opinion, based upon the conduct of a single herd, he afterwards saw reason to modify considerably, and eventually came to the conclusion, that the elephant is much cleverer than the dog. He also was thanked by a Hindoo for a kindness and doubts whether "any Anglo-Indian will believe it really occurred;" from which it will be perceived that Mr. Hornaday's acquaintance with the featherless bipeds of India was limited to specimens hardly worth preserving as types. Further on he "is not ashamed to say that he *hates* the gentle Hindu."

It is to be regretted that a writer evidently intelligent and energetic should permit himself such a license of expression about a set of people with whom he could not converse even in Hindustani; on the strength of his acquaintance with a few low-caste servants and hunters, who, upon the whole, seem to have served him fairly well.

After the Nilgiris, Mr. Hornaday shot in the Anamalai Hills with great success; but his shooting was much like that of the "Old Forest Ranger," the "Old Shikari" (whom he suspects, as some other people do, of having had a very slippery foot-rule) and other great Nimrods. It is well described, but there is nothing new about the story to most of us; and it is rather matter for the *Field* than for this Journal. At the end of his account of it is a short treatise upon elephants, worth reading by any one who has never read a treatise upon elephants before. The most noticeable item in it is his insistance, for cause shown, upon the specific distinction of the Ceylon elephant.

From Madras he went to Ceylon, and landed sick with fever at Colombo; whereupon the Colombiads took him to be drunk. As, by his account, part of the accommodation of a Hotel in Colombo was a special room for gentlemen past taking themselves home, perhaps they were not much shocked.

However he found a doctor who cured him of the fever by a prescription which, for the benefit of all future patients, Mr. Hornaday records. He thinks, however, that it isn't all right; and we can affirm without fear of the faculty that any gentleman who brewed it according either to the text or to the explanatory note, would be in possession of a cure for all earthly ills.

It provides for a quarter of an ounce of strychnine per diem, for 4 days running.

But it cured Mr. Hornaday as easy as he would have cured a tiger-skin.

Colombo, according to our author, is the most beautiful city of the tropics. The only ugly thing about it is the name of an Esplanade. It furnished him with lots of fish and marine invertebrata, and with the curious fact that the *Echini* of Ceylon and Malayana lose their spines unless soaked in spirits before drying, whereas those of the Red Sea, the Mediterranean, and the West Indies can be dried without soaking, and the spines will not fall off. Most or all of our Bombay *Echini* are certainly the better for the spirit-bath. On the British coasts some can dispense with it.

The Government of Ceylon charged Mr. Hornaday spirit duty on his methylated spirits, and would not refund it, which seems hard. At least it may be confidently affirmed that no Indian Custom House would charge on such spirits. The other side of the story is not, however, before us.

Here comes in a digression upon the immunity which Naturalists enjoy, it appears, in the enlightened republic of Venezuela; where their outfit and supplies are free of duty, including arms, rum, and salt. This is a very good idea, and we think that this Society might very well address the Government of India with a view to a similar exemption. Doubtless other learned bodies in the other Presidencies would support us; and natural science will become popular—except with the Commissioner of Customs. By this time, doubtless, every living human being in Venezuela is a Naturalist—more or less.

Mr. Hornaday travelled pretty nearly all round Ceylon, halting at various uncomfortable places to collect marine animals, chiefly.

He rejoiced greatly over a specimen of *Rhamphobatis* (*Rhynchobatus*) *ancylostomus*, the rare "*Mivil*" of our coast, called in those seas "*Cululava*" and "*Mannuluva*"; and in preparing it he found 130 spines of small sting-rays sticking about its chops; each representing, as he concludes with great probability, the last futile remonstrance of the sting-ray against being devoured by its big cousin. He also got a monkey shark (*Stegostoma tigrinum* he says) over 6 feet long; but the description and plate seem to indicate some other fish; possibly a new species; as any one may see by comparing them with Dr. Day's in our Library, and with our specimens in spirits. *Stegostoma* is not so rare a fish as Mr. Hornaday seems to have thought. After that he got *Urogymnus Asperimus*, a fine porcupinish ray, of whose skin some Malayan savage men make shields occasionally, corals, birds, and crocodiles. These last were of our broad-snouted species, the "Mugger," which, in Ceylon, Mr. Hornaday calls *Crocodilus palustris*, as we do (following Gunther), though in India he calls it *C. bombifrons*. He remarks on its power of standing with the belly clear of the ground, walking, and even running; and this he observed in specimens eight feet long. The present writer has seen it in half-grown and young specimens. It is certainly rare amongst the *Crocodilia*, which is probably the meaning of our author when he says that he "never observed it in other *saurians*." This taken literally, is nonsense; and in contradiction with the context.

He shot 44 flying foxes with five shots; and skinned them; and didn't die of it; and he got a *Manis pentadactylus*; or as we sometimes call it a "scalyant-eater" (*Marathice* "*Kaul-manjar*") and was told by the Sinhalese that this creature (of which he gives a beautiful vignette) curls himself around the elephant's trunk and suffocates him!

He went to Point de Galle, and found a very rare animal in that port, *viz*., an honest "Moor-man," who sold him real stones at reasonable rates, under the name of Muhammad "Ossen" (presumably "Hasan" or "Husain.")

And then he shook the dust off his feet against the Government of Ceylon and sailed to Singapore which he calls "the Hub of the Far East."

In Singapore he found little to collect, having come at the wrong season, though, on a subsequent visit the Malays brought him marine miscellanea "by the boat-load." Amongst many specimens of *Homo sapiens* he found three Americans, the Consul and his two daughters; and thinks it worth while to record that the first was "loyal to the back bone, and devoted heart and soul to the interests of the Government he represents," which one would hope is hardly a rare character amongst Consuls; although the maintenance of a Consul to look after his own two daughters in a port where no other resident specimen of the nation was to be found, seems to be a diplomatic luxury on the part of the "Government he represents."

However, two more arrived during Mr. Hornaday's stay and satisfied him "in spite of the Scotch blood" of one of them.

He found that the Europeans drank more brandy and soda than was good for them, which is a common complaint with him, as with other temperate men who make it a custom to frequent fourth-rate hotels in seaport towns. "Of the social life of Singapore he knew nothing," but "from what he was told" thanked God for America, as a better place to know something of society in.

Having contemned what he "knew nothing of" to his heart's content, and visited the private Menagerie of the famous Mr. Whampoa; Mr. Hornaday started for Selangore, and wisely made friends with the Superintendent of Police, by whose advice he went to a place called Jerom, on a "night of the kind especially made for boating" (a good phrase), and there he proceeded to catch *Crocodilus porosus*, which he calls the sea-crocodile (also a good phrase), although he only once saw the species out at sea, as it seems to be rather an estuarine reptile. He shot a few; but his best specimens were caught with the "Alir," an ingenious Malayan "trimmer" which he describes and figures. He saw monkeys (*Macacus cynomolgus*) picking up small crustacea at low water; and captured a *Hydrosaurus* similarly employed. Also he had a great hunt in the mud after a jumping fish (*Periopthalmus schlosserii*) which any one who pleases may reproduce in Bombay Harbour if he will be content with our allied "mud-fish" (*Boleopthalmus Boddaarti*). Centipedes swarmed in his bed and clothes, and he didn't care. Moreover he cured a man of the stab of a sting-ray, which had quite perforated the hand, with tincture of arnica, "divine stuff," as he calls it. After this he returned to Klang, the Capital of Selangore; and started thence for Kwala Lumpor, the centre of the tin mines of that district. Here the most wonderful thing he found was "Jules Mumm's best at 60 cents a quart" (=Half a crown a bottle); but a little ahead of this he discovered the "Durian" (*Durio zibethinus*) and appears to have been the first white man who ever fell in love with that remarkable fruit (a cousin of our jack-fruit) at first sight. Durians are nearly as large as jacks, and sold at this period, 17 for a dollar, and our hero invested a dollar in them then and there.

The durian groves were tended by Malays, who lived, for fear of wild beasts, in platforms on the trees, such as we should call "Macháns." Further on Mr. Hornaday met with "Junglies" called Jacoons; who had never housed in any other way; and whom he supposes to be descended from emigrant Bornean Dyaks. These primitive folk live (or lived then) on game and forest produce alone, specially bats swarming in certain caves, obtained by the simple process of knocking them down with sticks, which the present writer has found pretty efficacious at Ajanta in the like case. "Fortunately they knew the value of money" and became shikaris to our author and his comrade; and assisted at the slaying of an elephant. Here Mr. Hornaday obtained a dead python; and here he digresses to observe that throughout the Indies he found serpents as scarce "as in *Ireland*;" which "was disgusting, after all the big snake stories I had heard." The only snake he saw in Selangore was "a vicious little viperine affair, which I killed with a prayer-book in Captain D.'s drawing-room, while kneeling at prayers one Sunday evening."

From Singapore Mr. Hornaday was bound for Borneo; but the Singaporeans couldn't or wouldn't tell him much about it. However he fell in with one of the District Officers of Raja Brooke, and accompanied him to Saráwak, as we call it; but on the spot people call it Kuching, which is to say "a cat."

He admired the Raja's government, and proceeded to collect specimens, and get ready for a trip into the interior. The Raja pays rewards for the slaughter of crocodiles (*C. porosus*), on a graduated scale, by the linear foot, and Mr. Hornaday gives the statistics of 1878 for two rivers. During that year 266 crocodiles were brought in to be measured and paid for. One was 13 feet 10 inches long, two others exceeded 13 feet, two more 12 feet, ten were over 11 feet, and 18 over 10 feet. The majority were between 7 and 9 feet long. The application of a foot-rule has a singularly dwarfing effect upon the dimensions of reptiles. Besides the estuarine *crocodilus porosus*, Borneo has a rare gavial (*Tomistoma Schlegelli*) which Mr. Hornaday did not see in the flesh, but he got a skull 3 feet 3 inches long.

The District Officers gave him a passage to the Sadong River, and quarters in the "Government House," or, as we should call it, the "District Bungalow," from which he hunted for several days, but got nothing to speak of; so acting on information obtained from the Dyaks of the Simuján he started up that river in his own boat, in company with a Government writer, Mr. Eng Quee. Here he made acquaintance with a Dyak "long-house," a whole village under one roof, and over one floor (the whole supported on piles), and at the first attempt he shot three ourang-outangs in one day.

This shikar was accomplished in a canoe, paddling in a forest flooded with several feet of water, yet dense and lofty enough to allow the ourang-outangs to travel from tree to tree at a great height from the ground. As ourangs can't swim, they have to stick to the tree-tops.

From August to December he lived amongst the Dyaks; occasionally meeting with the Raja's officers, or accompanying them on their tours. Then he packed up and went home. This last part of the book, dealing with Borneo, its beasts and its people, is very much the best of it. The author really did make acquaintance with the country and people, and his observations about both are valuable, very unlike his hasty generalizations on Indian matters. He killed gibbons and ourang-outangs and "proboscis monkeys," and collected more strange creatures than we have space to enumerate.

Altogether his book is better worth reading than any recent book on the Far East and the part of it dealing with his own adventures and special subject is as good as it can be; the "*obiter dicta*," as we have already remarked, are frequently hasty, and, we regret to add, occasionally in the very worst taste.

The illustrations are of very various degrees of merit. Those by the author's own hand would make Mr. Ruskin stare and gasp, but have a certain quaint verisimilitude. Others, borrowed (always with acknowledgment) or executed for the work by professional artists are of high quality.

PROCEEDINGS.

The usual Monthly Meeting of the Society took place on Monday, the 10th January 1887.

Dr. D. Macdonald presided.

The following new members were elected :—Mr. W. W. Barr, Rev. E. S. Hall, Mr. John Wallace, Major T. T. Leonard, Mr. W. F. Melvin.

The Honorary Secretary, Mr. Phipson, reported receipts of contributions to the Society's Collection, amongst which were two Birds of Paradise from H. H. The Maharaja Holkar; Lizards and Snakes from Mr. F. Gleadow; a large collection of Fishes &c., from the Red Sea and Perim from Capt. Aves; a collection of Butterflies from Col. C. Swinhoe; and one of plants from Mr. James Murray.

To the Library were contributed :—Magazine of Natural History, Vol. 18, Nos. 107-108, from Mr. H. Littledale; Two Years in the Jungle (Hornaday), from Lieut. W. A. Connop, R. N.; Useful Plants of the Bombay Presidency (Dr. Lisboa), from the Author; Journal of Comparative Medicine and Anatomy, Vol. I.; Journal of the Brovelle Society of Natural History, Nos. 1 and 2 Proceedings of the Linnæan Society of N. S. Wales, Vol. I., Part 3.

Mr. Murray, late Curator of the Kurrachee Museum, exhibited a collection of Marine Algæ consisting of 212 species, from the Coast of Sind, and described the same. Dr. Kirtikar read a paper on Marine Algæ collected by the Hon'ble Mr. Justice Birdwood on the Ratnagiri Coast. Mr. Sterndale exhibited a fine head from his own collection of *Cervus maral*, the Persian stag, and described the differences between it and the Cashmere stag.

The usual Monthly Meeting of the Society took place on Monday, 7th February 1887.

Dr. D. Macdonald presided.

The following new members were elected :—Lieut. W. A. Connop, R.N., Mr. H. T. Silcock, C.S., Mr. Louis Bergl, Col. G. Merewether, R.E., Dr. J. H. Irving.

Mr. R. A. Sterndale was unanimously elected Vice-President in the place of Dr. Maconachie, who had resigned.

Mr. H. M. Phipson, the Honorary Secretary, then reported and acknowledged contributions to the Society's collections and library.

Mr. R. Gilbert exhibited a broken piece of a Sambur's horn, measuring 44¾ inches, which he had shot off an animal in Asirgarh. The fracture had taken place above the brow antler, so that the horn must have been of extraordinary measurement.

Colonel Charles Swinhoe then read a most interesting paper on "Mimicry in Butterflies for protection," illustrated by many beautiful examples from his private collection. This paper will appear in the next number of the Society's Journal.

The March Meeting of the Society was held on Monday, the 7th, when upwards of seventy members were present.

Mr. R. A. Sterndale presided.

The following new members were elected:—Sir M. Melvill, K.C.I.E., Mr. T. Walker, Mr. N. F. Surveyor, Mr. Pherozeshah Merwanjee Jeejeebhoy.

Mr. Phipson, the Honorary Secretary, acknowledged various contributions to the Society during the past month, and also the following books for the Library:—

Bulletins of the California Academy of Science, Vol. II., No. 5; Record of the Geological Survey of India, Vol. XX.; Verhandhengen des Zoologisch Botanischen; Gesellschaft in Wien XXXVI., Band III.-IV., Quartal; Journal of Comparative Medicine and Surgery, Vol. II., No. 1; Life of Frank Buckland (Bompas), from Mr. E. C. K. Ollivant, C. S.; Sport in India (Aberigh Mackay), from Mr. J. A. Murray; Annals and Magazine, Natural History, from Mr. H. Littledale.

A collection of 40 specimens of snakes lent by Mr. G. W. Vidal, C.S., were exhibited, also a rug made by Mr. E. L. Barton out of 15 Afghan fox skins.

The Secretary announced that through the generosity of a dozen members the Society had been able to purchase for Rs. 150 the splendid pair of Ovis Polii horns which had been exhibited in their rooms.

Mr. J. H. Steel, A.V.D., Principal of the Government Veterinary College at Parel, read a paper on "The Horse, a Zoological Study," which will appear in the next number of the Journal.

Mr. Sterndale exhibited, through the courtesy of its owner, the Agent of the Waterbury Watch Company, the now-celebrated white monkey, which so nearly came to a tragical end in the great fire at Madras. He stated that it was a female albino of the common bonnet monkey, *Macacus radiatus*.

A further description of this monkey, with a plate, will be given in the next number.

JOURNAL

OF THE

BOMBAY

Natural History Society.

No. 3.] BOMBAY, JULY 1887. [Vol. II.

THE WATERS OF WESTERN INDIA.

PART IV.—GUJARAT.

(By a Member of the Society.)

FROM the Konkan northwards to the tropic of Cancer lies the province of Gujarat, bounded on the east, at first by the northern extremity of the Sahyadris, up to the Kondai Bari Pass. Just north of this, the last elbow of the chain turns sharply eastwards to form the plateau of Nizampur; and for about 25 miles, as the crow flies, the boundary between Gujarat and Khandesh in the valley of the Tapti is an imaginary line. I am here using "Khandesh" as a Geographical expression only. Politically it extends some miles to the westward in a country called the Nowapur Peta. But the most convenient physical boundary mark is the "Haran-pal" (or "Buck's leap") on the Tapti; the more so as we are here dealing with water. This is a rock barrier over which the river forms a cascade in fine weather, though in flood it is said to be merely a rapid.

All the waters of Khandesh proper pass over this fall, no matter where they come from; but the district officially called Khandesh has some outlying villages on the Deccan plateau, draining into the Godavari, and also includes a tract called the Akráni Pargana in the valley of the Nerbudda (Narmada).

The Nerbudda also has its "Haran-pal" corresponding to that of the Tapti; and an imaginary line drawn through the Satpura

Mountains between the two will serve for a prolongation of our eastern boundary, and may fairly be protracted through the western branches of the Vindhyas to the tropic of Cancer.

This last makes an excellent northern limit to a province which has none precisely defined by nature; and it happens, too, to coincide very well with the northernmost limits of British Gujarat; and the points at which the rugged country to the east and the plains to the west begin to show the characters in man, beast, and soil of Rajputana. The Deccan trap in the hills begins here to give way to other formations; and the plains assume more and more the character of the Indian Desert. I am aware that some naturalists have recently included the Deesa region, and even country much further north, as Gujarat—chiefly, it would seem, because the Bombay Army has garrisons there. An ideal boundary for an ornithologist would perhaps be the death-scene of the northernmost Painted Francolin and southern green pigeon (*Crocopus chlorigaster*); but the tropic is, on the whole, the best boundary, and coincides pretty closely with those of native geography and ordinary English conversation.

To the west of Gujarat proper lie the Peninsulas of Kattywar and Kutch, which, in geology, flora, and fauna, may be assigned to the desert region, with the south-western parts of the Ahmedabad District such as Gogo, where we get tertiary fossils on Piram Island. To the south of these lies a shallow and sandy sea, prolonged, east of them, into the Gulf of Cambay. In the rains, when the great and little "Rans" of Kutch fill and communicate with the "Nal" of Viramgaum, and this again with the Gulf, no doubt the fleets of the Royal Canoe Club might circumnavigate them to this day.

Gujarat proper, as I have defined it, has two very well marked regions. Under the hills it is broken and wooded, drained by small rocky streams which run nearly dry in the hot weather. In the extreme south, indeed, there is no marked line between Gujarat and the Konkan, but here begins a plain, which gradually widens, between the wooded hill country and the sea. The rivers, especially those rising in the western ghâts, resemble (while in the rough ground) the streams of the Konkan. But at Surat we come upon the Tapti and at Broach upon the Nerbudda, both members of the second class of Indian rivers and already great perennial streams when they enter this province. North of these we have the Mahi and Sabarmati—streams far inferior to them, but still respectable—and all four flow for a great part of their course in wide sandy channels between high alluvial banks, as much resembling in appearance the great river-beds of the Deccan as their local tributaries and lesser neighbours do those of the Konkan.

All four are subject to violent floods; and once they top their banks, the flat nature of the country lays it a good deal at their mercy.

The great characteristic of the waters of Gujarat, however, is that its plain is, especially to the northward, a country of *tanks*. The rainfall (which in the hills is high, reaching 100 inches, and probably much exceeding that on some hill tops) is here moderate, and the great thickness of the alluvial soil often makes it impossible to get water in a well of reasonable depth.

The natural remedy is found in tanks, and it will make my later remarks clearer if I describe a typical Gujarat tank. Where the ground slopes sufficiently for the water to know which way to run (which is not always the case), a great crescent-shaped ditch is dug with its horns, of course, pointing against the stream and the convex side downwards. The earth out of this is thrown out on the outer or convex side, and forms an embankment of which the crest ought to be perfectly level tapering in thickness towards each horn; and if the measurements are true, meeting the natural slope of the ground at the points. As the greatest pressure is expected on the centre of the crescent, this is naturally the most massive part of the dam; and that part of the trench which is its ballast-pit will naturally be widest and deepest. But, besides this, ambitious engineers in old days went on digging on the inside of their trench long after the dam was big enough, throwing up the spoil into hills, often into islands, some of them quite high enough to be conspicuous from afar in so flat a country. Such mounds are apt to be crowned with a Hindu temple or Musalman tomb, having usually a few trees around it, and, when isolated, are naturally very favourite spots with waterfowl and crocodiles on account of their safety from disturbance. I have here described a large first-class tank, which would have 30 acres or upwards of water when full. There are many such, and more modest ponds are innumerable in the northern plains. These are so liable to inundation that, in practice, at least once a year, a fish can change his quarters in almost any direction he pleases, following drainage channels which, in the dry season, can only be detected by careful survey.

When full, such a tank as I have mentioned is of course a half-disc of water; and as it dries, this becomes more and more crescentic, till, when the water is near the original level of the soil, the undug centre is a marsh surrounded by a crescent of deep water. This is the best time for water-fowl, the waders taking up their quarters in the marshy central promontory while the swimmers feed around its shore, and especially in the horns of the crescent. During the heat of the day they will sit upon its point or, if there be an island, around that, or float quietly in the centre of the widest water.

It will be seen at once that on such a lake the best point for stalking a flock will probably be at each horn of the embankment; but, once the birds are up and flying about, the points of vantage are on the internal promontory and islands, if any.

The angler's best place, on the contrary, is in the centre of the outer curve of the water and inner curve of the dam, as there the water is deepest and there will be the biggest fish.

If, as often happens, one is encamped upon the tank, this is all very convenient, as the best trees are sure to be at the outside of the centre of the crescent which has the most permanent water-supply. On very large and old tanks the embankment is often well planted at this point. Now, it is pleasant to fish near the tents, but better to shoot out of range of them. It may here be remarked that if the camping ground is S.-W. of a large tank, it is often dangerous in the cold weather (especially for women and children). The cold land wind, blowing over shallow water and marsh, seems to strike deadly chill; and if one must camp in such a place, the north face of every tent should be carefully closed pretty early in the evening, and extra precautions taken in the matter of clothing and bedding.

Such a camp, if one is not inclined to shoot near the tents, gives in any province great opportunities for watching the birds with the help of a good glass. They get pretty well accustomed to natives and cattle, and, after a day or two, to the tents.

I have often been able to watch the coots, jacanas, sand-pipers, and towards the end of the cold weather, snipe, at very close quarters; and the other day I had a painted and a "full" snipe together in the focus of my glasses for 15 minutes, within 20 paces. The difference in their practice is noticeable, the painted snipe feeding in the water a few inches from the mud and the "full" snipe in the mud a few inches from the water. Both "dibbled" in the mud for a perceptible time, making repeated strokes without quite withdrawing the bill. * The sand-pipers, on the other hand, feed equally in the water and in the mud, but they peck once only, withdrawing the bill immediately with a very rapid motion and elevating it to swallow almost as quickly, something like a hen drinking.

I focussed lately a group of two spotted sand-pipers and a bronze winged jacana, which was lovely to see, the brilliant metallic colours of the latter fairly blazing in the tropic morning and his somewhat clumsy figure contrasting strongly with the graceful forms and quiet colouration of the sand-pipers. The one looked like some Japanese work in two or three metals; the other two like a sketch by some quiet European artist.

Besides the tanks we have (here alone in Western India) numerous natural lakes, not widely distributed, but gathered in groups here and there in the north.

The largest, the "Nal" of Viramgaum, has nine miles by nearly six of open water in December, and an equal area of marsh. It i brackish, but not too much so for freshwater fish, and it is a very paradise of water-fowl. The water is nowhere much more than six feet deep, generally much less, which is all in their favour, but causes a nasty little sea to get up quickly, the more so as the low desert shores afford no shelter.

The islands are mostly wooded with acacias 15 or 18 feet high, enough to cut a figure in such a country. About 35 miles north of this are some salt lakes or marshes, much smaller and chiefly remarkable as great roosting places for wild-fowl.

Again, 100 miles away in the north-east are the lakes of Parantej, beginning with the "Bokh," an ancient river-bed now appearing as a huge trough in the plain, with a string of pools down its centre. The largest of these, the "Great Bokh," is of about 140 acres, if I recollect right, and the next, the "Little Bokh," of 80; but I have no details here. There are several smaller pools, and they swarm with fish and fowl.

A group of smaller pools lies within a few miles of Parantej, east of the Hathmati canal, and another, near Dehgaum, in the Gaekwar's country, north of the direct road from Ahmadabad to Harsol. The

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* *Note.*—"Full" snipe, when quietly put up under these circumstances, often rise silently, without the usual alarm-note, and with little or no "twist" in their flight.

largest is between Harsol and Morasa, and is said to consist of 360 lakelets. I shouldn't wonder if there were really more, but not one of them is itself of any great size. The Khara Lake, which is the largest, may have an area of nearly 100 acres in the rains, but is nowhere 6 feet deep.

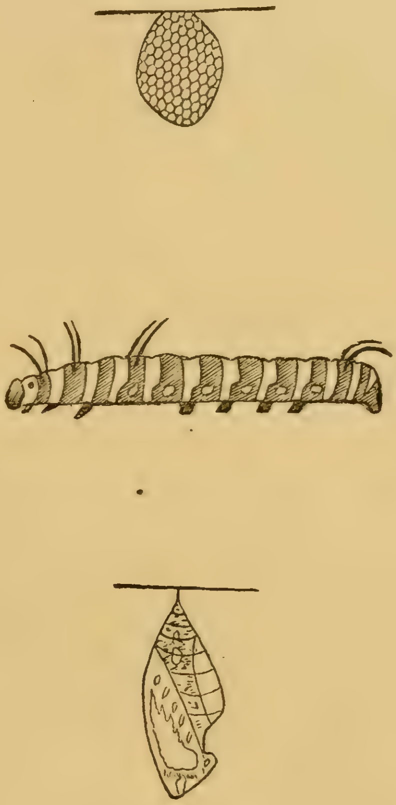
NOTE ON *HESTIA MALABARICA.*

By Capt. T. Macpherson, Bo. S.C.

As nothing is known regarding the early history of *Hestia Malabarica,* it may interest members of the Natural History Society to learn that I have succeeded in rearing it from the eggs. On the 28th of February last, I was in Camp at Devimani on the Kanara Ghauts. On the afternoon of that day, whilst walking through a patch of evergreen forest, I noticed a ♀ *Hestia,* apparently intent on finding a place to deposit her eggs. I therefore stood still and watched her. She fluttered about for a considerable time round a tree that was thickly covered by a creeper with large cordate leaves. At last, when I was almost tired of watching her, she settled on one of these leaves and deposited an egg on the under surface. This I quickly secured, and on a careful examination of a number of other leaves of the same plant I discovered some 8 or 10 more freshly deposited eggs (I give illustrations of the egg, the full grown grub and the pupa). The egg is always deposited singly on the under surface of the leaf; it is white, oval, about $\frac{1}{16}$ inch long by $\frac{1}{32}$ broad, attached to the leaf by one of the small ends and marked with about 22 longitudinal rows of hexagonal indentations. The eggs hatched out in from 6 to 7 days, and about 2 days before the grub emerged its black head could be distinctly seen through the thin shell. The larva emerges from a little to one side of the apex of the egg, eating only a small hole sufficient for its exit; it then eats its cast off shell for its first meal.

On emerging the grub is about $\frac{3}{16}$ inch long, skin transparent pale yellow, head and feet black, and through the skin are visible the white rings of the more mature grub, also the two black dots on the back of the 2nd segment. It has 4 minute pairs of fleshy tentacles arranged as in the more mature grub.

In a few days the first skin is cast and the grub then assumes the colours and markings which it retains until it changes to pupa. It eats its cast skin in the first two changes only.



The Eggs, Caterpillar and Chrysalis of

HESTIA MALABARICA.

The young grub has the peculiar habit of eating holes in the centre of the leaf instead of from the margin inwards, as with most caterpillars, but this habit it gives up as it increases in size. It conceals itself generally on the under surface of the leaf. In from 20 to 25 days it attains to full size, and is then about 2 inches long by $\frac{1}{4}$ inch broad at the centre, cylindrical, slightly tapering towards the extremities, provided with 4 pairs of black fleshy tentacles about $\frac{1}{4}$ inch long, one pair being on each of the following segments—3, 4, 6, and 12, skin smooth, glossy, head black, 2nd segment white with two small black dots on the back; all the other segments white with a broad band of black round the centre of each; legs black. Segments 6, 7, 8, 9, 10, and 11 have on each side on the black ground small round patches of bright scarlet, particularly distinct on the 6th and 11th segments; belly black.

On attaining its full size the grub spins a small pad of silk on the under surface of a leaf, attaching its last pair of legs firmly to this pad and hanging thus freely suspended head downwards; it remains thus for about 24 hours, when it casts its skin and changes to pupa.

The pupa is naked, hanging freely suspended from its oval segment as in all the Nymphalidæ; it is 1 inch long by $\frac{7}{16}$ broad; colour golden yellow, with large patches of bright metallic gold, the black spots on the wings of the butterfly showing through the yellow parts of the chrysalis.

In 12 or 13 days the pupa loses its brilliant colouring and metallic lustre and turns black, and about 24 hours later the butterfly emerges.

I have given a few specimens of the pupa to the Natural History Society, so that if my description is faulty it can be corrected.

The food-plant I was unable to define, but I left some leaves with the Society, and perhaps they have been classed by this time. The creeper was unfortunately not in flower, nor could I find any seeds.

OBSERVATIONS ON THE FEEDING, &c., OF THE INDIAN ROCK SNAKE (*PYTHON MOLURUS*) KEPT IN THE SOCIETY'S ROOMS,

From 27th May 1886 *to 20th May* 1887.

By H. M. Phipson, C.M.Z.S., Hon. Sec., B. Nat. Hist. Soc.

The following particulars, showing the amount of food consumed by the Python in the Society's Rooms in one year with the variations of its temperature during the period of hybernation and other details will, I think, be of interest to the members.

During the twelve months between 27th May 1886 and 20th May 1887, the snake ate 23 rats, 3 hens, 3 crows, and 1 kestrel, all of which were given to it alive. It is worthy of note that the rats on being placed in the cage appeared to take little or no notice of the snake. They would frequently run over its coils in their efforts to find a way out of the cage, and on occasions, when the snake remained quiet for a time, they would frequently approach it, smell it, and even bite it. The hens appeared to have even less instinctive fear of the snake, and would, if left to themselves for a short time, commence scratching and picking up grains in the cage. The crows, on the other hand, showed considerable apprehension of the danger.

It will be seen that during the hot months the period of digestion averaged about eight days, whereas in the cold weather it became much slower, the two rats eaten on 21st December being retained until 28th February.

During the cold weather, from 21st December to 13th April, a period of 113 days, the snake refused food and remained in a very sluggish, sleepy condition. During this period of hybernation the temperature of the reptile fell from 82° (normal) to 73°, a fall of 9 degrees. Taking the temperature was a matter of considerable difficulty. The snake is very strong, and it often required as many as six persons to hold it still while the thermometer was inserted. The results are, however, of particular value, as such observations cannot be made in European menageries, where artificial heat has to be used.

The snake cast its slough four times during the course of the year: three times in the hot weather, at intervals of 2 months, and once after it had recovered from its hybernation.

Date when Fed.	Description of Food.	Date of Defœcation.	Date of Casting Slough.	Temperature taken.	Temperature.
1886.		1886.	1886.	1886.	
27th May	1 Kestrel	3rd June ...	27th May ...	......	
7th June	1 Rat	12th June ...	......	......	
22nd „	1 Crow	29th June ...	......	......	
25th „	1 Rat				
28th „	3 Rats	17th July ...	17th July......	......	
20th July	1 Rat.........	1st August.	......	......	
27th „	1 Rat.........				

Date when Fed.	Description of Food.	Date of Defœcation.	Date of Casting Slough.	Temperature taken.	Temperature.
1886.		1886.	1886.	1886.	
28th July	1 Crow	6th August..	......	......	
29th ,,	1 Crow				
2nd August	1 Rat	22nd August.	......	......	
4th ,,	1 Rat				
6th ,,	1 Rat				
26th ,,	1 Rat	2nd Sept. ...	......	......	
30th ,,	1 Rat	27th Sept. ...	27th Sept. ...	......	
10th September	1 Rat				
28th ,,	1 Rat	14th October.	......	......	
13th October	1 Hen	2nd Nov. ...	......	......	
21st ,,	1 Rat				
30th ,,	1 Hen	27th Dec. ...	......	9th Nov.	82 °
8th November	1 Rat			28th ,,	79½°
17th December.	1 Rat				
19th ,,	1 Rat	1887.			
21st ,,	2 Rats	28th Feb. ...	......	......	
1887.			1887.	1887.	
13th April	1 Rat	Thrown up....	10th April ...	3rd January	75¼
24th ,,	1 Rat	1st May......	......	29th ,,	73
10th May	1 Rat	16th ,, ...	......	20th Feb.	78
20th ,,	1 Hen	28th ,, ...	......	7th March	82

NOTES ON THE BREEDING OF THE KENTISH RINGED PLOVER (*ÆGIALITIS CANTIANUS*) WITHIN INDIAN LIMITS.

By Lieut. H. E. Barnes.

Many years ago Captain (now Colonel) Vincent Legge found the Kentish Dotterel breeding in numbers on the banks of the salt pans in the south-eastern portion of the island of Ceylon.

Mr. Hume having received eggs and a skin from Captain Legge writes as follows in *Nests and Eggs of Indian Birds* :—

"Two of these eggs sent me by Mr. Legge measure respectively 1·23 and 1·2 by 0·87 and 0·85, and therefore in dimensions correspond precisely with those of the next species,* as, indeed, they do also in colour, shape, and markings.

"Mr. Legge also favoured me with one of the old birds, which he considered to have belonged to the eggs. It is clearly *Cantianus*, but it is in entirely non-breeding plumage (though killed on the 7th July) without either black or rufous about the head. He also informs me that all the specimens killed by him at that time were similarly in non-breeding plumage.

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* 849. *Ægialitis dubia.*

"The bird sent me is a young bird, a year old or thereabouts, and I cannot help fearing (every one who has taken their nests in Europe knows how difficult it is to catch them on their nests) that Mr. Legge's specimens may all have been young birds that remained behind when their parents returned to their breeding haunts, and that the eggs which he attributes to them in reality belonged to individuals of the next species."

The following season (1873), Captain Legge again found them breeding and shot the old birds from the nest, but still Mr. Hume remained unconvinced.

Up to the present time I am not aware of anything more being placed on record regarding the breeding of the Kentish Plover within Indian limits, but Dr. Scully found them breeding on the 25th April in Eastern Turkistan, and it will perhaps be remembered that Captain Butler shot a specimen at the island of Henjam, in the Persian Gulf, in May, with the testes much developed as if breeding, but he does not say what plumage this particular bird was in. He also says that he found the Kentish Plover breeding on the bare sandy plain at Jashk; and although he found no eggs, he caught a young bird unable to fly, about ten days old, and a specimen he shot at the same time was in winter plumage.

On the 28th April of the present year, Mr. J. W. N. Cumming, a young but earnest and reliable fellow-worker in Oology, found a clutch of three eggs placed in a slight depression in the sand at the base of a small hillock not far from the sea; on the 9th May he found three nestlings of the same species, and from his description of the manner in which the parent bird (which he shot) tried to entice him from their vicinity, there can be no reasonable doubt of their authenticity.

This skin was forwarded by Mr. Cumming to the Honorary Secretary of the Bombay Natural History Society, from whom I received it. It is without doubt a young bird of *Ægialitis cantianus*, exactly as Mr. Hume describes; but to prevent any possibility of error I had the skin identified by Mr. Murray, Manager of the Victoria Natural History Institute, Mazagon, and for many years Curator to the Karachi Municipal Museum, who, after a most careful examination, fully endorsed my identification. Mr. Cumming's valuable find has therefore confirmed Colonel Legge's assertion, that the eggs he took in Ceylon belonged to *Æ. cantianus* and not to *Æ. dubia*.

Mr. Hume lays some stress on the fact that the eggs sent to him by Colonel Legge are much smaller than European specimens usually are; but if, as seems certain, only yearling birds breed with or near us, then their eggs, being under the average, need not excite surprise. The eggs of *Ægialitis cantiana,* taken by Dr. Scully in Eastern Turkestan, are about the same size. Below I append a table giving the dimensions of the two eggs in Mr. Hume's possession, of four with Colonel Legge, three of Dr. Scully, and one sent me by Mr. Cumming. The first eggs of many domesticated birds are often abnormally small, as every housewife knows, and I have a crow's egg, taken from the nest, not much larger than a sparrow's egg.

I have very carefully compared one of the eggs taken by Mr. Cumming (which he kindly lent me) with European eggs, and I find that, except in size, it does not differ: the ground colour and the markings are exactly similar, but on the other hand it differs considerably from eggs of *Æ. minutus,* Pall (*Jerdoni*), of which I took a large number at Neemuch. The difference is hard to explain in words; but when the eggs are placed side by side it is very noticeable. The markings of the egg of *minutus* being more speckly and scratchy and not so distinct as in eggs of *cantianus,* I am myself quite convinced of the authenticity of these eggs.

Dimension of Eggs of Ægialitis cantianus.

No.	Mr. Hume.		Colonel Vincent Legge.		Dr. Scully.		Mr. Cumming.		Remarks.
	Length. Ins.	Breadth. Ins.	Length. Ins.	Breadth. Ins.	Length. Ins.	Breadth. Ins.	Length. Ins.	Breadthi. Ins.	
1	1·23	0·87	1·21	0·85	1·24	0·92	1·25	0·87	Mr. Hume says that European eggs vary from 1·25 to 1·64 inches in length and from 0·95 to 0·96 in breadth.
2	1·2	0·85	1·25	0·89	1·22	0·91	...	...	
3	...	...	1·23	0·89	1·21	0·90	...	...	
4	...	...	1·2	0·92	...	...	...	...	

ON MIMICRY IN BUTTERFLIES FOR PROTECTION.

By Col. Chas. Swinhoe, F.L.S., F.Z.S., F.E.S.

That butterflies are to be found all over the world, clothed in colours and patterns closely resembling their surroundings, has been long known. Groups like the Satyrinæ that are fond of shady places and live on hill sides and rocky dells are nearly always of a dull-brown colour; the Euplœinæ that inhabit dark moist dells and live in the thick undergrowth of forests are all black; the Pierinæ that fly about in the sun in almost any kind of climate are generally white or yellow; and the desert group of this family, the Teracoli, that mostly frequent barren sandy tracts in the hottest parts of the world, have their white colours tinted and patched with most brilliant sun-spots of bright yellow and salmon colour; they only fly about in the hottest part of the day, and are very difficult to distinguish. Then there are the leaf butterflies, or Kallimas, and their allies, which, when on the wing, frequent the tops of high trees; their flight is very swift, and most of them are of large size. On the upper surface their wings are often brilliantly coloured, but underneath have the colouration and markings of various kinds of leaves, and when they settle, you see them vanish into a tree and become at once invisible. The common Indian form, *Kallima inachis*, for instance, a N.-W. Himalayan insect, generally settles amongst the dried leaves of a tree, and perching head downwards with closed wings so exactly resemble a dried leaf as to be invisible. Many of the Pierinæ have also mimic eaves on their under surface. The largest of them are the Hebomoias. I have only two species of this genus, *H. glaucippe*, from various parts of India—very plentiful in Bombay, on Malabar Hill—and the Nicobar species, *Rœepstorffii*, and they both represent excellent imitations of leaves on their under surface. The subject, however, of the mimicry of one form of butterfly or another form was first brought clearly before the scientific world by Mr. Bates in an excellent paper which appeared in the Transactions of the Linnæan Society for 1862, Vol. 33, p. 495, and subsequently Mr. Wallace brought many remarkable facts on this subject to light. It was observed by Mr. Bates that imitating species are comparatively rare, whilst the imitated are to be found in great numbers, the two sets living together. The imitated were for the most part brilliantly coloured insects, and he therefore concluded that they must be protected from the attacks of birds, &c., by some secretion or noxious odour, and this has now been abundantly proved, and his paper on this subject in P. E. S. 1866, 3rd December, p. 45, is well worth reading. I do not propose to give just now a paper of scientific deductions. The principle of mimicry has been written about and argued out by many scientific men since Mr. Bates first brought the matter to light in 1862. I simply propose to show as many of the types of mimicry as I can from the examples out of my own private collection of butterflies. As to how one butterfly comes to mimic another for protection has been explained by many authors, and not always on the same theory; but I take it that Darwin's explanation that many species of Lepidoptera are liable to considerable and abrupt variations of colour is the keynote of the whole mystery. Let us look at *Hypolimnas misippus.* The normal form of this butterfly is black, with large white spots on the wings; the female mimics *Danais chrysippus* in its colouration and markings, this butterfly being of a bronze-reddish colour. Now the male of *Hypolimnas misippus* is a very pugnacious insect and is very active, and has a remarkably quick flight, and is therefore capable of protecting itself; it is very good food for birds, lizards, &c., and whenever caught is a delicious mouthful; the female, however, is much slower in flight, and when heavily laden with eggs is easily captured. *Danais chrysippus,* on the contrary, like all the Danainæ group, is a butterfly that no bird or lizard will touch, and both these species live in the same places. Now, supposing at some former period, in accordance with the well-known fact that *Hypolimnas misippus* in common with many species of lepidoptera being liable to considerable and abrupt variation in colour (I myself have a very curiously coloured female of this group), if a female appeared of a reddish or bronzy tinge (a not uncommon occurrence with black butterflies), would it not be probable that it would have a greater chance of escaping the attacks of birds and lizards than its black sisters? Some of its progeny would also probably have a bronzy tinge, and these also would have the greater chance to escape, and so on, from generation to generation the more bronzy the offspring became, and the more they resembled the colouration of the protecting species, the more they would become protected themselves, until, in the course of ages, the black form of the female *H. misippus* would cease to exist and its place would be taken by the beautiful female mimic of *Danais chrysippus;* and it is curious to observe that the protected and protecting forms are invariably found together. *Danais chrysippus* is an insect common in many parts of the world, all over India, Burma, and Ceylon, in the Philippine Islands, in Turkey, Madagascar, Arabia, and the west, south, and south-eastern coast of Africa, and in all these places (I am not sure about Turkey) the protected form, *Hypolimnus misippus,* is also to be found. In Aden and in several parts of

Africa there is a form of *Danais chrysippus,* called *D. alcippus,* with white hind wings, and in all such places the protected form of *H. misippus* is found with white wings; and in Aden, on the Kutch Coast in Sind, and in parts of the interior of Africa, there is a form of *D. chrysippus* called *D. dorippus,* without the black apical patch to the four wings, and in these places the female of *H. misippus* is also coloured and marked similarly. This form of the female of *H. misippus* is frequently to be seen in Bombay and other parts of India, and it is not at all uncommon, though not nearly so plentiful, as the *D. chrysippus* form. On observing this I have for some years collected all the *D. chrysippus* I could get together in the expectation of getting some *D. dorippus,* and in this I have not been disappointed, and I have now specimens in my collection from Bombay, Poona, Khandalla, and from the Punjab. It is, however, nothing like so common as the female of *H. misippus,* which mimics this form, reversing the rule that the imitating species are comparatively rare whilst the imitated swarm in large numbers; but this only shows that in former ages in these places the form *D. dorippus* was a common form, and that it has gradually been dying out and is now very nearly extinct. On the principle that mimicry is merely for protection, and that the protecting butterflies are those most abundant, we would here in India naturally expect to find the several species of the sub-families Euplœinæ and Danainæ more frequently mimicked than any other kind, because many of the species of both these sub-families are to be found in great abundance in most parts of India, and all are distasteful to birds, lizards, &c., and this is actually the case. It is very difficult to demonstrate facts of this nature from a private collection from want of sufficient specimens, but happily my collection affords some very interesting examples, and though I cannot in all cases show the exact species mimicked, some of the mimicking species being from parts of India, from which I have not many specimens, still I can show forms sufficiently allied to make the matter understood. We will first take the Euplœinæ, of which the common form is *E. core.* It has many allies all over India, and its allies are more or less closely mimicked by several species of Papilio—*Papilio panope, Papilio clytia, Papilio lankeswara, Papilio dravidarum,* and the female of *P. castor,* also *Papilio tavoyana,* which exactly mimics *Euplœa alcathoe* from the same parts of India, and of which I happen to have two good examples. There is another butterfly the female of which also mimics the Euplœas—a butterfly called *Hypolimnas bolina,* of the family Nymphalinæ, widely separated from the family Papilioninæ. In case No. 2 are also some very interesting mimics of two other common species of Euplœa—*E. midamas* and *E. rhadamanthus*. On the left of the former are two moths called *Amesia aliris*, which mimic the male, and three other moths called *Amesia midama* (all of the family Chalcosidæ) which, mimic both sexes of *E. midamas;* and on the right of these Euplœas are also five excellent mimics, all butterflies of the family Elymniinæ, *E. leucocyma* and *Dyctis patna,* the sexes of which mimic the same sexes of *E. midamas*. In the next column are some specimens of *E. rhadamanthus* of both sexes and to their right are a number of *Euripus halitherses,* a butterfly of the family Nymphalinæ, the males of which mimic a Danais I do not possess—(I have, however, put in an allied form from Java to show the pattern), and the female mimics two forms of Euplœa, *E. rhadamanthus* and a black Euplœa I do not possess. Next we will take the red Danainæ (case 3), *D. chrysippus, D. dorippus,* and *D. alcippus*. We will there see the female of *Hypolymnas* mimicking all these, as before explained, and *Danais genutia* you will find in the next column mimicked by the females of three different species of the family Elymniinæ, *i. e., E. fraterna* from Ceylon, *E. caudata* from South India, and *E. undularis* from Sikkim and Assam. There is a female of the last named species received last week from Rangoon along with the allied form of *D. genutia* from that part of India, with white hind wings called *D. hegisippus,* and it is very curious to observe that the hind wings of this and *E. undularis* as also whitish. In this case I also show you another species of this family called *Dyctis vasudeva,* which mimics a Delias of the family Pierinæ, a gaudily-coloured common genus which nothing will eat. In case No. 4 are some white Danias mimicked by various kinds of Papilios, by one species of the family Nymphalinæ, *Hestina nama,* and by one species of the family Satyrinæ, *Orinoma damaris*. *Euplœa tytia* and *E. malaneus* beautifully mimicked by *Papilio agestor* and *P. Govindra;* also *P. epycides, P. megareus, P. macareus, P. xenocles,* and *Hestina nama* of the family Nymphalinæ, all of which mimic various forms of white Danais, the nearest allies of which to be found in my collection I have placed in the case for comparison. Finally, in case No. 5 there are some insects that mimic the common *Papilio diphilus* and its allies, a butterfly most distasteful to birds, &c. In the left is *P. pammon,* the female of which mimics two species, *P. diphilus* and *P. hector,* and in the Nicobars the female of the variety Nicobarus mimics the Nicobar variety of *P. diphilus,* called *P. camorta.* Then you will see *P. janaka* is mimicked by a moth called *Epicopeia polidora,* of the family Chalcosidæ, and *P. aidoneus* is mimicked by another moth of the same genus called *Epicopeia polinora.* If we examine into the moths we find numerous cases of mimicry, commencing with the Zygænidæ, which mimic various kinds of hornets, wasps, and flies, but time does not admit of my going into these. There is another form of so-called mimicry, which is not mimicry at all. In the family Euplœinæ there are many series of species which in their markings much resemble each other, but as they are all distasteful to birds, lizards, &c., there can be, in so far as we know, no reason why they should mimic each other; but, as has been already shown to you, many of them are very closely mimicked by various other kinds of butterflies, some of which belong to families widely separated from each other and by many moths. All the Indian species of Euplœinæ, except one, *E. Andamanensis,* are coloured black, and it is undoubtedly a fact that many of them, though differing so much in the shape of their wings and in their sexual marks as to have caused their separation into different sub-genera, are so nearly like each other in their markings as to be hardly distinguishable except to the experienced lepidopterist. These similarly marked species, in so far as I can understand it, must have had the same common ancestor, and for some reason unknown to us, though their markings have remained similar, the shape of their wings and the sexual brands on their wings, have become altered in the course of time, to adapt them to their conditions of life in the great struggle for existence. It is also very curious to note how evenly these changes seem to have occurred in widely separated places, such, for instance, as in Bombay and Ceylon, where we have the common form, *E. core,* a black insect with largish white sub-marginal and marginal spots; it has the hinder margin of the fore wings nearly straight, and one small sexual brand on the fore wings of the male. We also get in Bombay *E. Kollari,* so like it in its markings as to make it seem at the first glance to be the same insect, but if you examine it carefully you will see that it is quite different in the shape and size of the wings in both sexes, and the hinder margin of the fore wing is deeply curved outwards, and the sexual brand of the fore wing is also quite different. Now in Ceylon we have a form of *E. core* called *E. asela,* also quite common there, differing from *E. core* in having all the spots small; and we also get *E. sinhala,* differing from *E. Kollari* in exactly the same way that *E. asela* differs from *E. core.* The core form is very common, and the Kollari form is rare, and I believe the latter was the original form; that it is gradually dying out and has been replaced and pushed out of existence by the other, which has now become the common form. I cannot do better than to end this paper with a quotation from Darwin on this subject; he says:—"As in each fully-stocked country natural selection necessarily acts by the selected form having some advantage in the struggle for life over other forms, there will be a constant tendency in the improved descendants of any one species to supplant and exterminate in each stage of descent their predecessors and their original parent."

MARATHI NAMES OF PLANTS.

WITH A GLOSSARY.

By Brigade-Surgeon W. Dymock.

Molesworth remarks, in the Preface to his Dictionary, that such words as आंबा, केळ or केळी, जांब, फणस, &c., are applied indifferently to the tree and to the fruit, especially in the Konkan; but that the Desh-people prefer to say आंब्याचें झाड, केळीचें झाड &c., for the tree or plant and आंबा, केळें, जांब, &c., for the fruit. (*Op. cit.* Pref. p. xiii.)

At the same time, when it is desired to distinguish between the tree and the fruit, it is usual to make the tree feminine and the fruit masculine, thus, the tree *Garcinia indica* would be रतांबी and the fruit रतांबा. To this rule, however, there are many exceptions, *e. g.*, another name for the same tree and for its fruit is भिरंड, a feminine noun, whilst the seed is called भिरंडी, also a feminine noun.

Many foreign names, usually more or less mutilated, are to be found in Marathi books; these are mostly derived from the Hindi, Guzarathi, and Canarese languages, and, of course, are most prevalent in the Northern Konkan, the Eastern Dakhan, and Savant Wari Districts.

We also find that many names are very local and often quite unknown beyond the district in which they are current.

Some names are applied very loosely to different plants having similar properties, or resembling one another in appearance; for example, अक्कुं and मेंढा, the first being used to indicate several of the

Araceæ and also various trees bearing plum-like fruits; the second is the name of *Æschynomene aspera*, *Hibiscus esculentus* and several plants having similar flowers, such as *Thespesia populnea*, &c.

The Marathi names of plants, like the Hindi and Guzarathi names, are many of them of Sanskrit origin, and as well as the non-Sanskrit names, are mostly descriptive of some property or peculiarity of appearance possessed by the plant; *e.g.*, वाघचबका (Tiger's-mouth) is *Gloriosa superba*, खुळखुळाडिंगळा (Rattle-pod Dingala) is *Crotalaria Leschenaultii*, खाजोटी and similar names are applied to nettles and such plants as irritate the skin, देवडांगर or (Fairies' pumpkin) is *Luffa echinata*, &c.

With regard to Sanskrit names of plants their identification is often a hopeless task, owing to the number of different plants to which similar names have been given. Thus *Amara* means *Euphorbia Tirucalli* and *Tiaridium indicum*, *Amarâ Panicum dactylon* and *Tinospora cordifolia*, *Amara-pushpa Saccharum spontaneum*, *Pandanus odoratissimus* and *Mangifera indica*. *Amritâ*, essentially the same name, means *Phyllanthus Emblica*, *Terminalia Chebula*, *Tinospora cordifolia*, *Piper longum*, *Ocimum sanctum*, *Citrullus Colocynthis*, &c.

In this neighbourhood *Amarvel*, *Ambarvel* or *Amritvel* would be understood to mean *Tinospora cordifolia*, a plant which really deserves the name of *Amarâ*.

Marathi names are not free from ambiguity; thus we have several *Rats'-ears*, Undirachekán or Undirkáni, in no way related to one another generically, and such vague terms as "the white tree," "the black creeper," "the sour bush" are not infrequent.

Many plants have the same names as cultivated ones, to which they bear a certain resemblance, with the addition of Jangli, Rán, Van or Vérá, words meaning 'wild,' *e.g.*, जंगली भेंडा, रानघेवडा, वेडी हळद वनजाई Wild Bhenda, Wild Lablab Bean, Wild Turmeric, Wild Jasmine, names applied to *Hibiscus tetraphyllus*, *Cylista scariosa*, *Curcuma aromatica*, *Salisb.* and *Clerodendron inerme*. Other distinguishing adjectives in common use are देव, equivalent to our Fairy, कांटे Thorny, कडू Bitter, काळा Black, खारा Salt, गोड Sweet, चौधारा Four-cornered, डोंगरी Mountain, तांबडा Red, थोरला Great, धाकटा Small, नाग Snake-like, पांढरा White, पहाडी Hill, पिवळा Yellow, भुई Ground, *i.e.*, procumbent or dwarf; महा Great, मोठा Large, राज Royal, रतन and रक्त Red, राम belonging to Ram, राय Royal, लहान Small, लाल Red, विलायती Foreign, शिव

belonging to Shiva, सूर्य Sun, सोन Golden, हिरण belonging to Deer, &c.

Corruptions are not uncommon; the country-people say Erá or Rérá for Vérâ (वेडा), wild. Yél for Vél, a creeper, Héla or Ela for Wahéla, the name of *Terminalia belerica*, &c.

Errors of pronunciation have been the cause of many mistakes in Marathi names when written in English characters.

In the list of names, which I now present to the Society, I have taken much trouble to ascertain the orthography of the words; 1st, by extracting all the names of plants from Molesworth's Dictionary and from several Marathi books on wild medicinal plants; 2nd, by comparing the list thus made with the names found in English botanical works, the spelling of which I have thus in most cases been able to correct when necessary. The list thus revised contains about 1,200 Latin names of plants found in this Presidency or sold in the Bazars with usually two or three Marathi or Guzarathi equivalents for each botanical name.

There still remain on hand a number of vernacular names for future identification and incorporation in the Glossary.

GLOSSARY.

Abelmoschus, *see* Hibiscus.	
Abroma augusta, *Linn.*	ओलकतंबोल Olaktambol, or ओलतकंबोल Olatkambol.
Abrus precatorius, *Linn.*	गुंज, Gunj, चणोटी Chanoti.
Abutilon graveolens, *W. & A.*	मुदाम Mudám.
,, indicum, *G. Don.*	पेटारी Petári, मद्मी Madmi, करंडी Karandi.
,, ,, var tomentosum.	चक्रभेंडा Chakrabhendá. The seed is sold in the shops as बलबीज Balbij. The capsules of these plants are called मुद्रा Mudrá, from their resemblance to a seal.
,, muticum, *G. Don.*	कसिली Kasili.
Acacia arabica, *Willd.*	बाभूळ Bábhúl.
,, ,, var	वेडीबाभूळ Veribábhúl.
,, ,, var	रामकांटा Rámakántá.
,, ,, seeds	धामुक्री Dhámuki.
,, Catechu, *Willd.*	खदेरी Khadéri, खैर Khair.
,, ,, catechuic acid	Found in cavities in the wood. खैरसार Khairsár.

Acacia catechu, var	शेप्याखैर Shepiya-khair.
,, concinna, *DC.*	शिका Shiká, the pods शिकाकाई Shikákai.
,, eburnea, *Willd.*	मरमत Marmat.
,, Farnesiana, *Willd.*	गूयबाभूळ Guyabábhúḷ, कंकर Kankar.
,, ferruginea, *DC.*	पांढराखैर Pándhará Khair.
,, Intsia, *Willd.*	चिलार Chilár, or चिल्हार Chilhár.
,, Latronum, *Willd.*	देवबाभूळ Deobábhúḷ, भेस Bhes.
,, leucophlæa, *Willd.*	हेवूर Hevúr, पांढरी बाभूळ Pándhari bábhúl.
,, odoratissima, *Benth.*	फळफळा Phalphalá.
,, pennata *Willd.*	शेंबी Shembi, शेंबरटी Shemberṭi.
,, procera	*See* Albizzia procera.
,, stipulata	*See* Albizzia stipulata.
,, Suma, *Kurz*	कमाटिआ Kamtiyá.
,, Sundra, *DC.*	लालखैर Lálkhair.
,, sp.	कीमजी Kimaji. (Grah. Cat. 468.)
,, (extract)	अकाकिआ Akákiá (*impd.*)
Acalypha indica, *Linn.*	कुपी Kupi, खोकली Khokali.
Acampe papillosa, *Lindl.*	रास्ना Rásná, कानभेर Kánbhér.
Acanthodium spicatum	*See* Blepharis edulis.
Acanthus ilicifolius, *Blume*	मारांडी Márándi, मोराण्णा Moránná.
Achillea millefolium, *Linn.*	राजमरी Rojamari.
,, Santolina, *Linn.*	बिरंजासिफ Biranjásif.
Achras Sapota, *Linn.*	चिकू Chikú, कवठ Kavath.
Achyranthes alternifolia, *Linn.*	गेतना Getaná.
,, aspera, *Linn.*	आघाडा Ághádá, खरमंजरी Kharmanjari.
Aconitum ferox, *Wall* (root)	बच्नाब Bachnáb, or बचनाग Bachnág (*impd.*)
,, heterophyllum, *Wall.* (root).	अतीस Atis, अतिविष Ativish (*impd.*)
,, sp. (tubers)	वखमा Vakhmá, बिखमा Bikhmá.
Acorus Calamus, *Linn.*	वेखंड Vekhand, वचवेखंड Vachvekhand. गोडा वच Gorá-vach.
Actinopteris radiata, *Linn.*	मापुरसिक Mápursik.
Adansonia digitata, *Linn*	गोरखचिंच Gorakhchinch, गोरखअमली Gorakhamli, वावबाब Vávbáb.
Adenostemma viscosum	रानजिरें Ránjiren.
Adenanthera pavonina, *Linn.*	वाल Vál, थोरली गुंज Thorli gunj.
Adenoon indicum	मोठी सोंकी Moṭhi-sonki.
Adhatoda Vasica, *Nees*	अडुळसा Adúlsá, बासा Básá, अटरुष Atarusha.
Adiantum lunulatum, *Burm.* et venustum, *Don.*	मुबारक Mubárak, हंसराज Hansráj, घोडखुरी Ghorkhúri.
Adina cordifolia, *H. f.*	एडू Edú, or हेडू Hedú.
Ægiceras corniculata, *Blanco.*	कांजला Kánjalá.

Ægle Marmelos, *Corr.*	बेल Bel, बिल Bil or बिल्वा Bilvá.
Ærides maculosum, *Lindl.*	इचवाच Ichvach.
Ærva lanata, *Juss.*	कापूर मधुरा Kápúr-madhurá.
Æschenomene aspera, *Linn.*	भेंड Bhend. The dry stem from Bengal, used by women to keep earring-holes open. The sola hat is made of it.
Ætheilema reniforme	*See* Justicia infundibuliformis.
Agaricus campestris, *Linn.*	अलोंबें Alombén.
,, officinalis	*See* Polyporus officinalis.
Agati grandiflora	*See* Sesbania grandiflora.
Agave americana, *Linn*	पालकांडे Pálkándé, जंगली अनास Jangli anás.
Ageratum conyzoides, *Linn.*	ओसाडी Osári.
Aglaia odorata, *Lour.*	प्रियंगु Priyangu.
Ailanthus excelsa, *Roxb.*	महारूख Mahárúkh.
,, malabarica, *DC.*	बाग्याधूप Bágyádhúp, ऊद् Ûd.
Alangium Lamarckii, *Thwaites*	काळा आकोल Kálá ákol, or अंकोल Ankol.
Albizzia amara, *Boivin*	लुलाई Lúlái, लायली Láyali.
,, Lebbek, *Benth*	शिरस Shiras, चिचोला Chicholá.
,, odoratissima, *Benth*	शिरस Shiras, चिंचिडा Chinchindá or चिचवा Chichvá.
,, procera, *Benth.*	किनई Kinai, गुरार Gurár.
,, stipulata, *Boivin*	ऊदुल Údul, कसीर Kasir.
Algæ sp. var. (pond weeds)	शेवाळ Shevál.
Aleurites moluccana, *Willd.*	अखरोट Akhrot, जाफळ Jáphaḷ.
Alhagí maurorum, *Desv*	जवासा Javásá, or यवासा Yávásá.
,, ,, manna (*impd*).	तुरंजबीन् Turanjabin.
Allamanda cathartica, *Linn.*	जहरी सोनटक्का Jahari sontakká.
Allium Cepa, *Linn*	कांदा Kándá, ऊळ Úl, पलांडू Palándú, पियाज Piyáj, डुंगळी Dungli.
,, porrum, *Linn.*	खोरट Khorat.
,, sativum, *Linn.*	लहसन Lahsan, लसूण Lasún, or लशुन Lashun.
,, sp. (Muscat garlic)	सीरेबरी Sirebari (*impd.*)
,, ,,	एककांदा लहसन Ekkánda lahsan, in bazar, it comes from Gogo.
Allophyllus Cobbe, *Bl.*	तीपिन Tipin, मेंड्री Mendri.
Alocasia indica, *Schott*	अळू Alún, तेरें अळू Téré-alún.
Aloe abyssinica, *Lam.*	कुंवार Kunvár, कोरकंड Korkand, कोरफाड Koraphad.
,, extract of	एळिया Eliyá.
,, perryi, *Baker,* extract, (*impd*).	सोकोत्री एळिया, Sokotri eliyá.

Aloexylon Agallochum	*See* Aquilaria Agallocha.
Alpinia Allughas, *Rosc.*.........	तारक Tárak.
,, Galanga, *Swz.*	कोष्ट कुलिंजन Kosht kulinjan. (*The great Galangal, impd.*)
,, nutans, *Rosc.*	पुणाचंपा Punáchampá, नागफणीचंपा Nágphanichampá.
,, officinarum, *Hance* ..	पानकीजर Pánkijar, कुलिंजन Kulinjan. (*China Galangal, impd.*)
Alstonia scholaris, *R. Br.* ...	सातवीण Sátavin, सप्तपर्णि Saptaparni.
Alternanthera sessilis, *R. Br.*...	कांचरी Kánchari.
Althœa officinalis, *Linn.* (root)	खित्मी Khitmi (*impd.*)
,, ,, (flowers)	गुलखैरो Gulkhairo (*impd.*)
Alysicarpus vaginalis, *D. C.* ...	चाई Chái, लडुंडीचाई Ladundi chái.
Amarantus Blitum, *Linn.*......	पोकळा Pokalá.
,, gangeticus, *Linn.*.	माठ Máth, red kind तांबडा माठ Támbará máth.
,, polygamus, *Linn.*..	चौळइ Choulai.
,, spinosus, *Linn.*.. ..	कांटेभाजी Kántebhájí, कांटेमाठ Kántemáth.
,, tenuifolius, *Willd.*	घोळ Ghol.
Ammannia baccifera, *Linn.* ...	अगिनबुटी Aginbuti, भारजांभूळ Bharjámbhúl, आगिया Ágiyá.
Amomum Cardamomum,	*See* Elettaria Cardamomum.
,, Korarima, *Pareira*..	मोठी एलची Mothi elachi, मोठे वेलदोडे Mothé veldoré (*impd.*)
,, subulatum, *Roxb.*...	,, ,, (*impd.*)
,, xanthoides, *Wall* ...	एलची दाणे Elachi dáne (*impd.*)
Amoora Rohituka, *W. & A.*...	रोहितक Rohitak, हरमखाना Haramkháná.
Amorphophallus campanulatus, *Blume.*	सुरण Suran.
,, ,, wild kind,	जंगली सुरण Jangli suran, and when dried, मदनमस्त Madanmast.
,, sylvaticus ...	*See* Synantherias sylvatica.
Amygdalus communis	*See* Prunus amygdalus.
Amyris heptaphylla	*See* Clausena heptaphylla.
Anacardium occidentale, *Linn.*	काजू or काजवीण Kájú or Kájvin. (Goa almond.)
,, ,, (tar) ...	डीक Dik.
Anacyclus Pyrethrum, *D. C.* (root)	अक्कलकारा Akkalkárá (*impd*).
Anamirta Cocculus, *W. & A.*...	वाटोळी Vátoli, कडवी Karvi.
,, ,, fruit	काकफळ Kákphal, कडवावाल Karvávál.
Ananassa sativa, *Linn.*	अननस Ananas, vulg. अन्नास annás.

Anastatica Hierochuntina, *Linn.*	कफेमरीयम Kafemariyam (*impd.*)
Anchusa tinctoria, *Desv.*	रतनजोत Ratanjot, रंगेबादशाह Rangebádsháh (*impd.*) from China.
Ancistrocladus Heyneanus, *Wall.*	खरवळी Khardali, करदोंडी Kardondi or करदोडी Kardodi.
Andrographis echioides, *Nees*	रानाचिमणी Ránchimni.
,, paniculata, *Nees.*	ओलें किराईत Olen-kiráit.
Andropogon aciculatus, *Retz.*	शंखपुष्पी Shankapushpi.
,, citratus, *D. C.*	ओला चाहा Olá, cháhá, पाल्याचाह Paliya-cháhá, पातीचा चाहा Páticha cháhá.
,, glaber, *Roxb.*	तांबट, Támbat.
,, laniger, *Desf.* (Herba Schænanthi)	जरांकुश Jarámkush, अझखीर Azkhir, खावी Khávi.
,, muricatus, *Retz.*	वाळ Vál, वारेळू Várélú, खसखस Khaskhas, उशीर Úshir.
,, Nardus, *Linn.*	ऊसधन Usadhan.
,, scandens, *Roxb.*	मारवेल, Márvel.
,, Schœnanthus, *Linn.*	राशेगवत Roshegavat, रोहिष Rohish.
Anethum graveolens	*See* Peucedanum graveolens.
Anguillaria indica	माडकलाई Márkalái, (Melanthium indicum, *Wall.*, *Pl.*, *As.*, *Rar.*, 3,259.)
Anictoclea Grahamiana	*See* Tetrameles nudiflora.
Anisochilus carnosus, *Wall.*	कापुर्ली or कपूरवल्ली, Kápúrlí or Karpúrvalli, चोरोंवा Choronvá, पाणजिरें Panjiren.
Anisomeles Heyneana, *Benth.*	चौधारा Chaudhárá.
malabarica, *R. Br.*	गोजिभा Gojibhá.
,, ovata, *R. Br.*	गोपाळी Gopáli.
Anisonema multiflora	*See* Phyllanthus reticulatus.
Anodendron paniculatum, *A.D.C.*	लामताणी Lámtáni कुलिवेल Kulivel.
Anogeissus latifolia, *Wall*	दाब्रिआ Dábriá दाउरा Dáurá.
,, acuminata, *Wall*	फास Phás.
Anona muricata, *D.C.*	माँमाफळ Mámáphal.
,, reticulata, *Linn.*	रामफळ Rámphal.
,, squamosa, *Linn.*	सिताफळ Sitáphal.
Anthemis nobilis, *Linn.*	बाबूना Bábúná.
Anthericum tuberosum, *Roxb.*	चिप्ली चाई Chipli chai, फुरशी Phúrsi, कुळी Kúlí.
Anthocephalus Cadamba, *Miq.*	कदंब Kadamb, न्ह्यु Nhyu.
Anthrocnemum indicum, *Moq.*	मचोळ Machol.
Antiaris toxicaria, *Leesch.*	चांदल Chándal, चांदकुडा Chándkura.

Antidesma Bunias, *Spr.*	अमटी Amati.
,, Ghæsembilla, *Gärtn.*	जोंध्री Jondhri.
Antirrhinum glaucum	*See* Schweinfurthia sphærocarpa.
Apium graveolens, *Linn.*	करफस Karafs, बोरीअजमोद Bori-ajmod.
,, involucratum	*See* Carum Roxburghii.
Aplotaxis auriculata	*See* Saussurea Lappa.
Aporosa Lindleyana	साला Sálá.
Aquilaria Agallocha, *Roxb.*	हिंदीअगर Hindi agar, कृष्णागर Krishna-agar.
Arachis hypogæa, *Linn.*	भुईमूग Bhuimúg, भुईशेंग Bhuisheng.
Aralia Guilfoylia	तापमारी Tápmárí.
Ardisia humilis, *Vahl.*	डिकना Dikná.
Areca Catechu, *Linn.*	सुपारी Supári, पुंग Púng.
Argemone mexicana, *Linn.*	दारूरी Dárúri, फिरंगी धोत्रा Phirangi-dhotrá, कांटेधोत्रा Kántedhotrá.
Argyreia argentea, *Chois.*	म्हैसवेल Mhaisvél.
,, elliptica	*See* Lettsomia elliptica.
,, sericea, *Dalz.*	गावेल Gávél.
,, speciosa, *Sweet.*	समुद्रशोक Samudra-shok.
Arisæma Murrayi, *Dalz.*	सर्पाचा कांदा Sarpáchá kándá.
Aristolochia bracteata, *Retz*	गंधाटी Gandháti किडामार Kirámár.
,, indica, *Linn.*	सापसन or सापसंद, Sápsan or Sápsand.
,, longa, *Linn.* (root)	झरावंदेकलान Zaráwandékalán (*impd.*)
,, rotunda, *Linn.* (root)	झरावंदेगरद Zaráwandégird (*impd.*)
,, serpentaria, *Linn.* (root).	काळावाळा Káláválá (*impd.*)
Arnebia sp.	रतनजोत Ratanjot.
Artabotrys odoratissima	*See* Uvaria odoratissima.
Artemisia Absinthium, *Linn*	अफसंतीन रूमी Afsantiné Rúmi (*impd.*)
,, maritima, *Linn.* (flowers).	किरमाणी ओंवा Kirmáni onvá.
,, Sieversiana, *Willd.*	दवणा Dauná.
,, sternutatoria	*See* Centipeda orbicularis.
,, vulgaris, *Linn.* var. indica.	सुरबंद Surband, vulg. सुर्पण or सुर्पिण Surpan or Surpin, derived from सूळ and बंद, as it is used to cure bellyache, worms, &c.
Arthrocnemum indicum, *Moq.*	मचोल Machol, घुरी Ghuri.
Artocarpus hirsuta, *Lam.*	अंजेली Anjeli, पाटफणस Pátphanas, रानफणस Ránphanas, फणसुल Phanasul.
,, incisa, *Linn.*	विलायती फणस Viláyati Phanas.
,, integrifolia, *Linn.*	फणस Phanas.
,, Lakoocha, *Roxb.*	लोवी Lovi, ओंड Aond, बढर Badhar, वातंबा Vátambá.

Arum nymphæfolium	*See* Colocasia antiquorum.
,, sessiliflorum	*See* Sauromatum pedatum.
Arundo Karka, *Roxb.*	देवनळ or देवनाळ Deonal or Deonál.
Asarum europeum, *Linn.* (root).	तगर Tagar (*impd.*), (seldom genuine).
Asclepias curassavica, *Linn.*	कुडकी Kurki, काकतुंडी Káktundi.
Asparagus adscendens, *Roxb.*	सफेदमुसळी Safedmusli, धोळीमुसळी Dholi musli.
,, officinalis, *Linn.*	हलीयून् Haliyun.
,, racemosus, *Willd.*	शतमुळी Shatmuli, झतर Zatar, आसवेल Ásvel.
,, sarmentosus, *Willd.*	
Asphodelus fistulosus, *Linn.*	बोखत Bokhat, बिंघरबीज Bingharbij.
Asteracantha longifolia	*See* Hygrophylla spinosa.
Astragalus sp. (gum sarcocolla).	गुजर Gujar (*impd.*)
Atalantia monophylla, *Corr.*	रानलिंबू Ranlimbú, माकडनिंबोणी Mákarnimboni, मातंगनार Mátangnár.
Atriplex hortensis, *Linn.*	जुरी Juri.
Atylosia Lawii	रानतूर Rántúr (A. lineata, *W. & A.*)
Avena sativa, *Linn.*	विलायती जाव Viláyati Jáu.
Averrhoa Bilimbi, *Linn.*	बिलिंबी Bilimbi.
,, Carambola, *Linn.*	खमरक Khamrak, करंबल Karambal, करमळ Karmal.
Avicennia tomentosa	तिवर Tivar (A. officinalis, *Linn.*)
Azadirachta indica	*See* Melia Azadirachta.
Balanites Roxburghii, *Planch.*	हिंगन Hingan, हिंगणबेट Hinganbét.
Balanophora sp.	गजपिंपळी Gajpimpali.
Baliospermum montanum, *Müll-Arg.* (seed).	जमालगोटा Jamálgotá (*false*).
,, montanum (root)	दांतिमूळ Dántimúl.
Balsamodendron Gileadense (fruit).	हबेलबलेसान Habelbalesán (B. Opobasamum (*Kunth*), (*impd.*)
,, ,, (balsam)	बलेसान Balesán (*impd.*)
,, ,, (wood)	उदेबलेसान Udebalesán (*impd.*)
,, Mukul, *Hook* (gum resin)	मुकुल Mukul, गुग्गळ Guggal (*impd.*)
,, Myrra, *Nees.* (gum resin).	हिराबोळ Hirábol (*impd.*)
,, Playfairii *Hook. f.* (gum resin.)	मीनाहरमा Mináharmá (*impd.*)
,, Roxburghii, *Arn.* (gum resin).	ह्मैशाबोल गुग्गुळ Mhaisábol, Guggul.
Bambusa arundinacea, *Willd*	मांदगाई Mándgái.

Bambusa Arundo, *Klein.*	चिवारी Chivári.
,, (silica of)	वंशलोचन Vanshlochan, तबाशीर Tabáshir.
,, sp.	मेस Més.
,, stricta, *Roxb.*	उधावांस Udhávâns.
,, vulgaris, *Wendl.*	कळक Kalak, वांसा Vánsá.
Barleria cœrulea	वाहिटी Wahiti, काळाकोरांटा Kála Korántá (B. strigosa, *Willd.*)
,, montána, *Nees.*	कोळिस्ता Kolistá, ईखरी Ikhari.
,, courtallica, *Nees.*	
,, Prionitis, *Linn.*	कळसुंदा or कासुंदा, Kalsunda or kásundá, पिंवळाकोरांटा Pivalá korántá, कोलिस्ता or कोळिता, Kolistá or Kolitá.
Barringtonia acutangula, *Gärtn.*	तीवर Tivar, ईंगळी Ingli.
,, ,, (fruit).	समुद्रफळ Samudraphal, सातफळ Sáthphal, धात्रीफळ Dhátriphal.
Basella alba, *Linn.*	मयाळ Mayál, वेळगोंड, Velgond, or वेलबोंडी Velbondi.
Bassia butyracea, *Roxb.*	फलवा Phalvá.
,, elliptica	*See* Dichopsis elliptica.
,, latifolia, *Roxb.*	मोवा Mová, महुआ Mahuá.
,, longifolia, *Willd.*	मोवा Mová, महुआ Mahuá.
Batatas paniculata	*See* Ipomœa digitata.
,, edulis	*See* Ipomœa Batatas.
Bauhinia purpurea, *Linn.*	देवकांचन Devakánchan, अतमटी Atmati.
,, malabarica, *Roxb.*	कोरल Koral, अमली Amli.
,, racemosa, *Lam.*	आपटा Áptá, अभिता Abhitá, वनराजा Vanrájá.
,, tomentosa, *Linn.*	पिंवळाकांचन Pivalákánchan, अश्मंतक Ashmantak.
,, Vahlii, *W. & A.*	चंबूरी or चंबूली Chambúri or Chambúli.
,, variegata, *Linn.*	कांचन Kánchan.
Begonia crenata, *Dryand.*	मूतिया Mútiyá.
Benincasa cerifera, *Savi.*	कोहोळा or कोव्हाळा, Koholá or Kovhálá कूष्मांड Kúshmánd.
Berberis Lycium, *Royle.* (fruit).	अंबरबारीस Ambarbáris.
,, ,, (wood)	दारहळद Dárhalad.
,, ,, (extract)	रसोत Rasot, रसवंती Raswanti.
Bergera Kœnigii	*See* Murraya Kœnigii.
Bergia verticillata, *Willd.*	हिंताल Hintál.
Berthelotia lanceolata	*See* Pluchea lanceolata.
Beta vulgaris, *Moq.*	चुकंदर Chúkandar, पालक Pálak.

Betula Bhojpattra, *Wall.* (bark)	भोजपत्र Bhojpatr, भूर्जपत्र Bhúrjpatr.
Bignonia chelonoides, *Linn.*	कुणक Kunak, पाडळ Pádal.
Bignonia undulata, *Roxb.*	कुणक Kunak.
,, spathacea	*See* Dolichandrone falcata.
,, stans, *Willd*	विलायती कुणक Viláyati kunak.
,, suaveolens	*See* Stereospermum suaveolens.
Biophytum sensitivum, *D. C.*	लाज्री Lájri.
Bischoffia javanica, *Bl.*	बोक Bok.
Bixa Orellana, *Linn.*	शेंद्री Shendri, केसरी Kesri, केसरबोंडी Kesar bondi.
Blepharis asperrima, *Nees*	अकडा Akra, पाहाडी अतगन Páhári-Atgan.
,, edulis, *Pers.*	उतंगण Utangan.
,, molluginifolia, *Juss.*	कांटेमाका Kántemâká.
Blighia sapida, *Don.*	आकी Áki.
Blumea aurita	*See* Lagera aurita.
,, holosericea and other strong smelling Blumeas.	भांबुरडा Bhámbúrdá, or भांबरूड Bhámbrúr.
,, sp. nov. near to B. eriantha.	निमुरडी Nimurdi.
Bocagea Dalzelli, *H. f. & T.*	साजेरी Sajeri, हाडकिंजळ Hárkinjal.
Boerhaavia elegans, *Chois.*	नाकबेल Nákbel (seeds eaten).
,, repens, *Linn.*	पुनर्नवा Punarnava, खांपरा Khápará. घेटुळी Ghetuli, काळीवसू Kálivasú.
,, verticillata, *Poir*	सतूरा Satúra.
Boletus crocatus, *Batsch.* var.	फणसआंबा or फणसअलोंबे Phaṇasámbá or Phanasalombé (Isca de Jaca of the Portuguese).
Bombax malabaricum, *D. C.*	सावर Sávar, मोच Mocha.
,, ,, (gum)	मोचरस Mocharas.
Borassus dichotomus, *White*	उखामंडळ Ukhámandal.
,, flabelliformis, *Linn.*	ताड Tár, ताडमाड Tármáṛ.
Borrera Ashneh	*See* Parmelia kamtschadalis.
Boswellia floribunda, *Endl.* (frankincense.)	विशेष Visesh, (*impd.*) vulg. ईसस Esas.
,, ,, (bark).	धूप Dhúp, कष्फ Kashfa (*impd.*)
,, serrata, *Roxb.*	सलाई Salai, गुग्गुळ Guggul, सालफळी Sálphali.
Bougainvillia spectabilis	बानबेरीस Bánberis.
Bovista, sp.	पाताळतुंबडी Pátáltumbri.
Brachyramphus sonchifolius	*See* Lactuca Heyneana.
Brassica campestris, *Linn.*	शिरिस Shiris.

Brassica juncea, *H. f. & T.*	मोहरी Mohari, राई Rái.
,, nigra, *Koch*	राई Rái.
,, oleracea, *Linn.*	कोबी Kobi, कोई Koi (Port.)
,, Rapa, *Linn.*	शलघम् Shalgham.
Brayera anthelmintica	*See* Hagenia abyssinica.
Briedelia sinica	*See* Phyllanthus lanceolarius.
,, montana, *Willd*	आसाणा Âsáná फत्तरफोड Phattarphor, पाल्हेसण Páléhasan, हसाणी Hasáni.
Bryonia laciniosa, *Linn.*	कावदोडी Kavdori.
,, umbellata	*See* Zehneria umbellata.
Bryophyllum calcynum, *Salisb.*	घायाळ Gháyal, घायपात Ghaipát, घायमारी Ghaimári. अडणमडण Aranmaran, पर्णबीज Parnabij or *leaf-seed*.
Buchanania latifolia, *Roxb.*	पियाल Piyál, चार Chár, चारोळी Charoli, चाराबोर Chárábor.
Butea frondosa, *Roxb.*	पळस Palas, खाकरा Khákará.
,, ,, (gum)	पळसगोंद Palasgond, खाकरागोंद Khákará gond.
,, ,, (seed)	पळसपापडा Palaspápará.
,, parviflora	*See* Spatholobus Roxburghii.
,, superba, *Roxb.*	पळसवेळ Palasvél, तिवस Tivas, तिवत Tivat बेलतिवस Béltivas.
Cactus indicus, *Roxb.*	अलिता Alitá.
Cadaba indica, *Lam.*	कधब Kadhab (Arabic), बाळपुवण Bálpuvan.
Cæsalpinia Bonduc, *Roxb.*	सागरगोटा Ságargotá, गजगा Gajagá.
,, coriaria, *Willd.*	लिबिदिबी Libidibi.
,, digyna, *Rottl.*	वाकेरी Vákéri.
,, pulcherrima, *Swtz.*,	शंकासूर Shankásúr, मोरशिखा Morshikhá.
,, Sappan, *Linn.*	पतंग Patang.
,, sepiaria, *Roxb*	चिल्लर Chillar.
Cajanus indicus, *Spr.*	तूर Túr.
Calacanthus Dalzelliana, *T. Anders.*	मोतयें Motayén.
Caladium sp. var.	अळूं Alún (cultivated for ornament).
Calamus Draco, *Willd.* (gum resin).	हिरादखन Hirádakhan, हिराडुखी Hirádnkhi.
,, Rotang	वेत Vet, बेत Bet.
Callicarpa lanata, *Linn.*	ऐसर Aisar.
Callitris quadrivalvis, *Vent.* The gum.	चंद्रस Chandras, (*impd.*)
Calonyction speciosum,	*See* Ipomœa bona-nox, *Linn.*

Colophyllum inophyllum, *Linn.*	उंडी or उंडीण Undi or Undin.
,, spurium	सरपून Sarpún, कालपून Kálpún. (C. Wightianum, *Wall.*)
,, tomentosum, *Wight.*	पून Pún, पुनई Punai.
Calosanthes indica	*See* Oroxylum indicum.
Calotropis gigantea, *R. Br.*	मांदार Mándár, अकडा Akrá, रूई Rúi, अर्क Arka.
,, procera, *R. Br.*	लालमांदार Lálmándár, तांबडाअकडा Támbará-Akrá.
Calycopteris floribunda, *Lam.*	बांगूली Bángúli, उक्षी Ukshi.
Calysaccion longifolium	*See* Ochrocarpus longifolius.
Camellia theifera, *Griff.*	चाहा Cháhá, चाई Chái.
Camphora officinarum	*See* Cinnamomum Camphora.
Canarium strictum, *Roxb.*	धूप Dhúp, गुग्गुळ Guggul.
,, ,, (resin)	काळेडामर Kálédámar.
Canavalia gladiata, *D. C.*	किसमरी Kismári, अबई Abai (C. ensiformis *D. C.*, the var. virosa is the wild form.)
,, virosa, *W. & A.*	कडसंबळ Karsambal, खरशिंगळ Kharshingal, खरसमुळी Kharsamuli.
Canna indica, *Linn.*	देवकेळी Deokéli, किमुष्कि Kimushki, कामाक्षी Kámákshi, कर्दळी Kardali.
Cannabis sativa, *Linn.*	भांगBhang.
,, ,, (female flowers)	गांजा Ganjá.
,, ,, (resin	चरस Charas.
Canscora decussata, *Don.*	साखवेल Sákhwél.
Canthium didymum, *Roxb.*	वरसंगी Varsangi.
,, Leschenaultii	चापयेल Chápyel (C. angustifolium, *Roxb.*)
,, parviflorum, *Lam.*	कीरणी Kirni.
,, umbellatum, *Wight.*	उरसूल Ursúl, टूप Túp.
Capparis aphylla, *Roth*	करील Karil, केरा Kérá, नेपती Népti.
,, brevispina	वाघंटी Vághanti, गोविंदा Govindá, C. zeylanica, *Linn.*
,, grandis, *Linn.*	पचोवांद Pachovánd.
,, horrida, *Linn. f.*	तरटी Tarti or तरंटी Taranti.
,, pedunculosa	कोलिस्ना Kolisna.
,, Roxburghii, *D. C.*	पूर्वी Púrvi.
,, spinosa, *Linn.* (bark).	कबर Kabar (*impd.*)
Capsicum sp. var	लालमिरची Lalmirchi.
Caralluma fimbriata, *Wall*	मकडशिंग Makarshing.
Carallia integerrima, *D. C.*	फुनसी Phúnsi.
Cardiospermum halicacabum. *Linn.*	बोधा Bodhá, शिवजल Shibjal, तेजोवती Tejovati, ज्योतिष्मती Jyotishmati.

Careya arborea, *Roxb.*	कुंभा Kúmbhá.
,, ,, (immature fruit).	वाकुंभी Vákumbhá.
Carica Papaya, *Linn.*	पोपया Popayá.
Carissa Carandas, *Linn.*	कारंदा Kárandá, करवंद Karavand, हरतुंदी Hartúndi.
Carthamus tinctorius, *Linn.*	कुसुंबा Kusumbá.
,, ,, (seeds).	कर्डई Kardai, करडी Kardi.
Carum Carui, *Linn.* (seeds)	विलायती जिरें Viláyati jirén.
,, copticum, *Benth.*	अजवान Ajwán, ओंवा Onvá.
,, nigrum, *Roxb.* (seeds).	सिअः जिरें Siah jirén.
,, Roxburghianum, *Benth.*	अजमोद Ajmod, करोंझा Karonzá, रानधणी Rándhani.
Caryota urens, *Linn.*	भेर्लामाड Bherlámár.
,, ,, (fruit)	अर्धीसुपारी Ardhisupári.
Caryophyllus aromaticus, *Linn.* (buds).	लवंग Lavang (*impd.*)
,, ,, (fruit).	नरलवंग Narlavang (*impd.*)
Casearia esculenta	मोडी Mori.
,, graveolens, *Dalz*	मोडी Mori, चिल्ला Chillá, बोखाडा Bokhárá.
,, lævigata	लैंजा Lainjá, मोडमसाई Mormassai, (C. esculenta, *Roxb.*)
,, tomentosa, *Roxb.* ...	चिल्ला Chillá, मसाई Massai, करै Karai.
Cassia Absus, *Linn.*	चिमर Chimar, चाकसू Chaksú.
,, alata, *Linn.*	दादमर्दन Dádmardan.
,, auriculata, *Linn.*	तरवड Tarvar.
Cassia Fistula, *Linn.*	बाहवा Báhavá, गरमाळा Garmálá, बाळकांटरी Bálkánteri.
,, lanceolata, *Forsk.*	सोनामुखी Sonámukhi, corruption of Suvarnamukhi, *Sans.*
,, occidentalis, *Linn.*	हिकळ Hikal, चक्रमर्द Chakramard.
,, pumila, *Lam.*	सरमल Sarmal.
,, Senna	सुरती भुईतरवड Súratibhuitarvar (C obovata.)
,, siamea, *Lam.*	कस्मोद Kasmod.
,, Sophera, *Linn.*	रानटांकळा Rántánklá.
,, Tora, *Linn.*	टांकळा Tánklá, कोवरीया Kovariyá, तारोता Tárotá or तरवटा Tarvatá.
Cassytha filiformis, *Mill.*	आकाशवेल Ákásavel, अंतरवेल Antarvel, आकाशमूली Ákásmúli.
Casuarina equisitifolia, *Forster.*	विलायती सरव Viláyatisaro.
,, muricata, *Roxb.*	
Cedrela Toona, *Roxb.* ...	तून Tún, कुडक Kurak.

Cedrus Deodara, *Loud*	तेल्यादेवदार Teliyá deodár.
Celastrus emarginata	*See* Gymnosporia emarginata.
,, montana	*See* ,, montana.
,, paniculata, *Willd.*	कांगोणी Kangoni, कंगु Kangu, पिगवी Pigavi.
,, Rothiana	*See* Gymnosporia Rothiana.
Celosia argentea, *Moq.*	कुद्रु Kúdrú or कुंद्रू Kundrú, मयूरशिखा Muyúrshikhá.
,, cristata, *Linn.*	राजगिरी Rájagiri, मयूरशिखा vulg. मोरशिखा Mayúrshikhá vulg. Morshikhá.
Celsia coromandeliana, *Vahl*	कुटकी Kutki, कोलहल Kolahal.
Celtis Roxburghiana	ब्रुमज Brumaj.
Centaurea Behen, *Linn.*	सफेद बहमन Safed Bahman.
,, moschata, *Roxb.*	शाह पसंद Sháh pasand.
Centipeda orbicularis, *Lour*	नकचिकणी Nakchikni, अफकर Aphkar.
Cephalandra indica, *Naud.*	तोंडली Tondli, बिंबी Bimbi.
,, ,, (wild, bitter).	रान Rán, or कडू Kurú, तोंडली Tondli.
Cerasus Pudum	*See* Prunus Pudum.
Ceratogynum rhamnoides, *Wight.*	चिकुडी Chikuri.
Ceratophyllum submersum, *Willd.* and other pond weeds.	धाकटी शेवाळी Dhakti shevúli.
Cerbera Odallam, *Gärtn.*	सूकनू Súkanú.
,, Thevetia	*See* Thevetia nerüfolia.
Ceropegia bulbosa, *Roxb.*	खप्परकडू Khapparkarú, गायला Gayalá.
,, juncea, *Roxb.*	कणवेल Kanvel.
Chamœrops Ritchieana	*See* Nannorrhops Ritchieana.
Chavica	*See* Piper.
Cheilanthes farinosa, *Spr.*	पातकुरी Pátkuri.
Chenopodium album, *Moq.*	घाणें Ghánén.
,, ambrosioides, *Linn.*	चाकवत Chákvat चंदनबटवा Chandanbatvá वासुकें Vásukén.
Chikrassia tabularis, *Adr. Juss.*	पभ Pabh, चिक्रास Chikrás.
Chlorophytum parviflorum.	*See* Anthericum tuberosum.
Chloroxylon Swietenia, *D. C.*	भेरिया Bheriyá, बिल्लो Billo, हळदरवा Haladravá.
Chrysanthemum indicum, *Linn.*	शेवती Shévati.
,, ,, (small flowered)	दवणशेवती Davan-shévati, रायशेवती Raishévati, दवणमुलगी Davanmulgi.
Chrysophyllum Roxburghii. *Don.*	तरसीफळ Tarsiphal, डोंगरी मायफळ Dongrimáyphal.
Cicca disticha	*See* Phyllanthus distichus.

Cicer arietinum, *Linn.*	चणा Chaná, हरभरा Harbhará.
Cichorium Intybus, *Linn.*	कास्नी Kásni, (*impd.*)
Cinnamomum Camphora, *Nees.*	कापूर Kápúr (*impd.*)
,, Cassia, *Blume*	दार्चिनी or दाल्चिनी Dárchini or Dálchini (*impd.*)
,, ,, (buds)	काळें नागकेशर Kálé nágkésar (*impd*).
,, iners, *Reinw.*	दार्चिनी Dárchini तज् Taj कुरफा Kurfá.
,, Tamala, *Nees.*	तमाला Tamálá.
,, ,, (leaves),	तमालपत्र Tamálápatra.
Cissampelos Pareira, *Linn.*	पाहारवेल Pahárvel, पाहारमूळ Páhármúl.
Cissus	*See* Vitis.
Citrullus Colocynthis, *Schrad.*	इंद्रायण Indráyan, इंद्रफळ Indraphal, इंद्रवारुणी Indravárúni, कुडूवृंदावन Kurúrundavan.
,, vulgaris, *Schrad.* (watermelon)	कलिंगड or कलिंगण Kálingar or Kálingan.
,, ,, var.	दिलपसंद Dilpasand.
Citrus aurantium, *Linn.*	नारिंगी Náringi.
,, decumana, *Willd.*	पपनस Papanas.
,, Limonum, *Linn.*	लिंबू Limbú.
,, medica, *Linn.*	महाळुंग Mahalung, जांभीर or जांबीर Jámbhir or Jambir.
,, ,, var. acida, *Linn.*	अंबटनिंबू or लिंबू Ambat nimbú or limbú.
Clausena heptaphylla, *W. & A.*	करणफळ Karanphal.
Clematis triloba, *Heyne.*	मोरवेल Morvel.
Cleome felina, *Linn.*	सुवर्णक्षीरी Suvarnakshiri.
,, viscosa, *Linn.*	कानफुटी or कानफोडी Kánphuti or kánphori, पिंवळी तिळवण Pivali-tilavan.
Clerodendron inerme, *R. Br.*	रानजाई Ránjai, कोयवेल Koivél.
,, infortunatum, *Linn.*	भांडीर Bhándir करी Kari.
,, phlomoides, *Linn.*	ईरण Iran or ऐरण Airan.
,, serratum, *Spr.*	भारंगी Bhárangi.
,, Siphonanthus, *R. Br.*	भारंगी Bhárangi.
Clitorea Ternatea, *Linn.*	कजली Kájali गोकर्णी Gokarni सुपली Supli.
Clypea Burmanni	*See* Cyclea Burmanni.
Cnidium diffusum	*See* Seseli indicum.
Coccinia indica	*See* Cephalandra indica.
Cocculus Leœba, *D. C.*	गुडूची Gudúchi.
,, macrocarpus, *W. & A.*	वटवेल Vatvel राम्रिक् Rámrik, cor. of रामरक्षा Rámrakshá वाटोली Vátoli.
,, villosus, *D. C*	वसनवेल Vasanvél पारवेल Parvel टान Tán.

Cochlospermum Gossypium, *D. C.*	गंनेरी Gannéri, गुंगलाय Gunglai.
Cocos nucifera, *Linn.*	नारळी माड Narali-már.
Coffea arabica, *Linn.*	काह्वा Kahva, बून Bún.
Coix barbata, *Roxb.*	वरीवल Varival.
,, lacryma, *Linn.*	रानजोंधळा Ránjondhalá, रानमकाय Ránmaka.
,, ,, (Seed)	कस्सइबीज Kassaibij.
Colchicum, *sp.*	गोडसुरिंजान् Gorasurinján.
,, ,,	कडू सुरिंजान् Karú surinján.
Coldenia procumbens, *Linn.*	त्रिपक्षी Tripakshi.
Colebrookia ternifolia	भामिनी Bhámini. (C. oppositifolia, *Sm.*)
Coleus aromaticus, *Benth.*	पानाचा ओंवा Pánáchá onvá.
Colocasia antiquorum, *Schott.*	अळूं Alún, अळवीण Alvin.
,, ,, (several var.)	कांसाळवत Kánsálvat, कांसाळूं Kánsálú. तेरें Teré, तेरेअळूं Téréalú, मांड Mánd or मांडी Mándi.
Colubrina asiatica, *Brogn.*	गुटी Gúti.
Combretum ovalifolium, *Roxb.*	झल्लोसी Jellosi, माधवेल Mádhvel, वेंडेधाऊस Vérédhaus.
,, Wightianum	पीलोख Pilok, (C. extensum, *Roxb.*)
Commelyna communis, *Linn.*	केनी Kéni, चिरोटी Chiroti, निळी Nili.
Conium maculatum, *Linn* (fruit)	कीर्दमाना Kirdamáná (*impd.*)
Connarus monocarpus, *Linn.*	सुंदर Sundar.
Conocarpus latifolia.	*See* Anogeissus latifolia.
Conocephalus niveus, *Wight.*	कापुसी Kápusi, करगूल Kargúl.
Convolvulus arvensis, *Linn.* (gum resin)	हरणपग् Hiranpag.
,, Scammonia, *Linn.*	सक्मुनिया Sakmúniyá (*impd.*)
Cookia punctata, *W. & A.*	वांप्पी Vámppi.
Coptis Teeta, *Wall.* (root)	मामीरान Mámirán (*impd.*)
Corallocarpus conocarpa, *Hook. f.*	महादेवी Máhádevi, शिवलिंग Shivaling.
,, epigæa, *Hook. f.*	कडवीनाई Karvinái.
Corchorus Antichorus, *Ræusch*	बहुफळी Bahuphali.
,, capsularis, *Linn.*	चोंचें Chonchén.
,, fascicularis, *Lam*	बहुफळी Bahuphali, हरणखोरी Hirankhori, मगरमिठी Magarmithi.
,, olitorius, *Linn.*	चिंच Chinch, बनपाट Banpát.
,, trilocularis, *Linn.*	कडू चिंच Karú chinch.
,, ,, (seeds).	राजजिरें Rájjirén.
Cordia angustifolia	गोंदणी Gondani. (C. Rothii, *Rom. et Sch.*).
,, latifolia	सपिस्तान् Sapistán, शेलु Shelú, वरगुंद Vargund.

Cordia Macleodii, *H. f. & T.*	धैवन or दैवन Dhaivan or Daivan.
,, Myxa, *Linn.*	भोकर Bhokar, शेलवंट Shélvant.
,, Wallichii	धैवन or दैवन Dhavan or Daivan (C. obliqua, *Willd.* var. Wallichii.)
Coriandrum sativum, *Linn.*	कोथमीर Kothmir, कोथिंबीर Kothimbir.
,, ,, (fruit)	धणे Dhané.
Corylus avellana, *Linn.* (nuts)	फिंदुक Phinduk or Finduk (*impd.*)
Corypha umbraculifera, *Linn.* (seed.)	वज्रबट्टू Vajrabattú, वज्रीवळ Vajrival.
Coscinium fenestratum, *Colebr.*	झाडीहळद Jhárihalad.
Cosmostigma racemosum, *Wight.*	जती Jati.
Costus speciosus, *Sm.*	खुंबारी कांदा Khumbári kándá, पेंवा Penvá, वागचवडा or वागराटी Vágchavrá or Vagráti.
Crataeva religiosa, *Forst.*	वायवर्णा Vayavarná, हाडवर्णा Hárvarná, रामला Rámalá, कारवन Kárvan.
Cressa cretica, *Linn.*	खर्डी Khardi, चवेल Chavel.
Crinum asiaticum, *Herb.*	नागदवण or नागदन Nágdavan or Nágdan.
,, augustum, *Roxb.*	गायदवण Gaidavan.
,, ornatum, *Wight.*	गदनीकंद or गदांबीकांदा Gadanikand or Gadámbikándá. (C. longifolium, *Roxb.*)
Crocus sativus, *Linn.* (saffron)	केशर Keshar (*impd.*)
Crossandra undulæfolia, *Salisb.*	अबोली Aboli, vulg. for आबोली Áboli.
,, ,, (flowers)	आबोल or आबोलें Abola or Ábolé.
Crotalaria juncea, *Linn.*	ताग Tág, सणबीज Sanbij.
,, Leschenaultii, *D. C.*	डिंगळी or डिंगळ, Dingli or Dingal, दायळी Dayli. खुळखुळडिंगळा Khulkhuldingalá.
,, Notonii, *W. & A.*	कुळई Kúlai.
,, retusa, *Linn.*	घाग्री Ghágri.
Croton hypoleucos, *Dalz.*	पांढरी Pándhari.
,, oblongifolium, *Roxb.*	घणसूर Ghansúr.
,, sebiferum, *Linn.*	पिंपळगांक Pipalgánk.
,, Tiglium, *Linn.*	जमालगोटा Jamálgota, जपाळ or जायपाळ Japál or Jaipál.
,, tinctorium, *Burm.*	सूर्यावर्त Súryávarta.
Cubeba officinalis	*See* Piper Cubeba.
Cucumis Colocynthis	*See* Citrullus Colocynthis.
,, Melo, *Linn.*	चिबूड Chibúr.
,, ,, var utilli ssimus.	तवसी,-शी, or-शीण Tavsi, Tavshi or Tavshin.
,, sativa, *Linn.*	काकडी Kakari, खिरा Khira.
,, trigonus, *Roxb.*	कारीट or कारिंट Kárit or Kárint, काटवेल Kátvel.

Cucumis trigonus, var. pubescens	टकमक or -की, Takmak or Takmaki.
Cucurbita Citrullus	*See* Citrullus vulgaris.
„ Pepo, *D.C.*	डांगर Dángar, भोपळा Bhoplá.
Cuminum Cyminum, *Linn.*	सफेदजिरें Sufedjire.
Cupania canescens	*See* Hemigyrosa canescens.
Cupressus glauca, *Spr.*	सरु Sarú.
Curculigo	*See* Hypoxis.
Curcuma Amada, *Roxb.*	अमाडा Amádá, काजुरागौरी Kájurágauri.
„ angustifolia, *Roxb.*	तवकीर Tavkir.
„ aromatica, *Salisb.*	रानहळद Ránhalad, अंबेहळद Ambéhalad, वेडीहळद Vérihalad.
„ cæsia, *Roxb.*	नरकचूर Narkachúr.
„ caulina, *Grah.*	चवर Chavar.
„ longa, *Roxb*	हळद Halad, हरिद्रा Haridra.
„ pseudomontana, *Grah*	सिंदरबर Sindarbar, सिंदरवानी Sindervani.
„ Zedoaria, *Roscoe*	कचोरा or कचोला Kachora or Kachola, *C. Zerumbet, Roxb.* The name Kachura is often loosely applied to all Curcumas.
Cuscuta reflexa, *Roxb.*	आकाशवेल Akashvel, अमरवेल Amorvel, अंतरवेल Antarvel, आकाशमूळी Akashmuli, सोनारवेल Sonárvel, सोनवेल Sonvel.
„ sp	अफतीमून Aftimún (*impd.*)
„ sp	कसूस Kasús (*impd.*)
Cyamospsis psoraloides, *D. C.*	गोवारी Govári.
Cyanotis axillaris	*See* Tradescantia axillaris.
Cyathocline lyrata, *Cass.*	गंगोत्री Gangotri.
Cycas circinalis	मलबारी सुपारी Malabári súpári. (C. Rumphii, *Miq.*)
Cyclea Burmanni, *Miers*	पाकर Pákar.
„ peltata	परेल Parel, पारवेल Párvel, पारयेल Par-yel.
Cydonia vulgaris, *Pers.*	*See* Pyrus Cydonia.
Cylicodaphne Wightiana, *Nees.*	पेशा Peshá.
Cylista scariosa, *Ait.*	रानगेवडा Rángevará.
Cynara scolymus, *Willd.*	किंगीन् Kingin, कुंजीर Kúnjir.
Cynodon Dactylon, *Pers.*	दुर्वा Durva, हरळ Harala, हरयेली Haryeli.
Cynoglossum canescens	लियाचर्दी Liyachardi (C. Micranthum, *Desf.*)
„ cœlestinum	*See* Paracaryum cœlestinum.
Cyperus bulbosus, *Vahl*	ठेगी Thegi.
„ pertenuis, *Roxb.*	नागरमोथ Nagarmoth, लवाळा Laválá.
„ rotundus, *Linn.*	मुस्ता Mustá, मोथा Mothá, बींबल Bimbal. The name Bimbal is applied loosely to many kinds of Cyperus.

Dœdalacanthus purpurascens *T. Anders.*	गुलशाम Gulshám.
Dœdalia gibbosa	करंबी Kerambi.
Dœmia exténsa, *R. Br.*	उतरण Utaran, उतरणी Utarni.
Dalbergia lanceolaria, *Linn.*	दंडूस Dandús, हरानी Haráni, गेंगरी Gengri.
,, latifolia, *Roxb.*	ताली Táli, ताकोली Tákoli.
,, ougeinensis	*See* Ougeinia dalbergioides.
,, paniculata, *Roxb.*	पासी or फासी Pási or Phási.
,, Sisso, *Roxb*	शिसु Shisú, शिंशपा Shinshapá.
,, sympathetica, *Nimmo.*	पेंटगुळीं Pentgúli, टिटाबळी Titábli, यकयेल Yekyel.
,, volubilis, *Roxb.*	अलाई Alai, मुंगणवेल Múnganvel.
Daphne Mezereum, *Linn.*	माझीरीयून Mázeriyún.
,, oleoides, *Schreb.*	पेच Pech.
Datisca cannabina, *Linn.*	अकलबीर or अकलबर, Akalbir or Akalbar.
Datura alba, *Linn.* & fastuosa.	कांटेधोतरा Kánte dhotará, धत्तुरा Dhattúrá.
,, Stramonium, *Linn.* var. Tatula (fruit.)	घरभुली Gharbhúli (*impd.*)
Daucus Carota, *Linn.* (fruit)	गाजर Gájar.
Decaneuron microcephalum	*See* Lamprachænium microcephalum.
Delphinium denudatum, *Wall.*	जदवार Jadvár (*impd.*)
,, Zalil, *Aitch. & Helm.*	त्रायमाण Tráyámán, अस्प्रक Asprak, गुलजलील Guljalil.
Dendrobium Pierardi	पत्रिक Patrika. (D. Lawanum, *Lindl.*)
Desmodium gangeticum, *D. C.*	सालवण Sálvan, डाय Daye, शालपर्णी Salparni.
,, recurvatum	रानगांजा Rángánjá, (D. laxiflorum, *D. C.*)
,, triflorum, *D. C.*	रानमेथी Ránmethi.
,, triquetrum, *D. C.*	काकगांजा Kákgánjá.
Dichopsis elliptica, *Benth.*	पांचोटी Pánchoti, पल्ला Pallá.
Dichrostachys cinerea, *W. & A*	सिगमकाटी Sigamkáti.
Digera arvensis	*See* Achyranthes alternifolia.
Dilivaria ilicifolia	*See* Acanthus ilicifolius.
Dillenia pentagyna, *Roxb.*	करमल Karmal, कनगलु Kanglú, करमवेल Karamvel, धाकटाकनगलु Dhakta-kanglú.
,, speciosa	मोठे करमल Mothe Karmal, (D. indica, *Linn.*)
Dioscorea aculeata, *Roxb.*	कांटेकांगी Kántekángi, कणगर or कणगी Kangara or Kangi.
,, bulbifera, *Linn.*	कडूकरंदा or कडवाकरंदा, Karúkarandá, or Karvá karandá.
,, oppositifolia, *Roxb.*	मांड Mánda, पाशपोळी Páshpoli.
,, pentaphylla, *Willd.*	ऊलसी Úlsi, शेंडवेल Shendvél.

Dioscorea sativa, *Willd.*	कोनफळ Konphal, चिना, Chiná.
,, tomentosa (?) perhaps, a variety of D. pentaphylla.	चायेन or चाईन, Cháyen or Cháin.
,, triphylla, *Willd.*	मांड Mánda
Diospyros assimilis, *Bedd.*	मुल्लीय Mulliya.
,, chloroxylon, *Roxb.*	निनै Ninai.
,, exculpta	टेंबुर्णी Temburni, माकडखिंडी Mákarkhindi, (D. Embryopteris, *Pers.*)
,, ,, (roots)	अक्षतेचें खोड Akshatéché Khor.
,, melanoxylon, *Roxb.*	तेंडू or तिंडूक, Tendú or Tindúka.
,, montana, *Roxb.*	गोविंदु Govindu, लोहारी Lohári.
,, sp. var.	आबनूस Ábnús. (*impd.*) *Ebony.*
,, Tupru, *Ham.*	तरतर Tartar.
Dipterocarpus turbinatus, *Gârtn.* (balsam).	गरजनेल Garjanel.
Dodonæa Burmanniana	जखमी Jakhmi. (D. viscosa, *Linn.*)
Dolichandrone falcata, *Seem.*	मेढशिंगी Medhashingi, मरशिंगी Marshingi.
Dolichos biflorus, *Linn.*	कुळिथी Kulithi.
,, Lablab, *Linn.*	वालपापडी Valpápari, पांटी Pánti, आवडी Avri.
,, ,, var.	घेवडा Ghevará.
,, sinensis.	*See* Vigna Catiang.
Dorema Ammoniacum, *Don* (gum.)	फेशुक Feshuk, उशक Ushak (*impd.*)
,, ,, (root)	बोई Boi (*impd.*)
Doronicum pardalianches, *Linn* (rhizome)	दारुणजे अक्रबी Dárúnajé akrabi (*impd.*)
Dregea volubilis, *Benth.*	अंब्री Ambri, हरणदोडी Hirandori.
Dryobalanops Camphora, *Colebr.* (Bhimseni camphor)	भीमसेनी कापूर Bhimseni kapúr (*impd.*)
Dysoxylum binectariferum, *Hook. f.*	बुरुंबी Burúmbi or बुरम Buram.
Ecballium Elaterium, *A. Rich.* (fruit).	कांटेरी इंद्रायण Kánteri indráyan.
Ecbolium Linneanum, *Kurz.*	रानआंबोली Rán aaboli, धाकटा अडुळसा Dhákta adulsa.
Echinops echinatus, *D. C.*	कांटेचुंबक Kántéchubak.
Echium sp. (leaves and flowers)	गौझबान Gaozabán (*impd.*)
,, ,, (?) rhizoma	रतनजोत Ratanjot (*impd:*)
Eclipta alba, *Hassk.*	बंग्रा or बंग्राज Bangra or bangráj, माका or माकडी Máká or mákri.
Ehretia buxifolia, *Roxb.*	पाला Pálá.
,, lævis, *Roxb.*	दातरंग Dátrang.

Elœagnus Kologa	नरगी Nargi, आंबगूल Ámbgúl, (E. latifolia, *Linn.*)
Elæocarpus Ganitrus, *Roxb.*	रुद्राक्ष Rúdráksh.
,, oblongus, *Gärtn.*	कास Kás, कास्सो Kásso.
,, robustus, *Roxb.*	जलपाई Jalpai.
Elæodendron glaucum, *Pers.*	भुतापाला Bhutápálá, तामरुज Támrúj, (E. Roxburghii.)
Elephantopus scaber, *Linn.*	पाथरी Páthri.
Elettaria cardamomum, *Maton.*	वेलदोडे Veldore, एलची Elchi.
Eleusine coracana, *Gärtn.*	नाचणी Náchni, नागली Nágli रागी, Rági.
Embelia Busaal	बरबटी Barbati, जोंधळी Jondhli, अंबटी Ambti, (E. robusta, *Roxb.*)
,, ferruginea, *Wall.*	अंबटःबरबटी Ambat-barbati.
,, Ribes, *Burm.*	वावडिग Váváring, करकनी Karkani, बाबिरंग Bábirang.
Emex sp. (plant)	शुकाई Shukai (*impd.*)
Emilia sonchifolia, *D.C.*	साधीमंदी Sádhimandi.
Enicostema littorale, *Blume.*	ममीज्वा Mamijvá, नाईचापाला Naichápálá.
Entada Pursætha	गारंबी or गारभी, Gárambi or Gárbhi, गरदंल Gardal, (E. scandens, *Bth.*)
Ephedra Alte, *C. A. Meyer*	लसतुक Lastúk.
,, vulgaris, *Linn.*	होम Hom of the Parsees, supposed to be the same as the Soma of the Vedas (*impd.*)
Epicharis exarillata	*See* Amoora Lawii.
Epicarpurus orientalis	*See* Streblus asper.
Eranthemum pulchellum	*See* Dadalacanthus purpurascens.
,, roseum, *Br.*	रान आबोली Rán áboli, दशमुळी Dashmuli, तांबडी कोरांटी Tambri-koránti.
Eragrostis cynosuroides, *Rom. & Sch.*	दर्भ Darbha.
Erigeron asteroides, *Roxb*	मरेडी Marédi, सोंसळी Sonsali.
Erinocarpus Nimmoanus, *Grah*	चेरा Cherá, चौरा Chourá.
Eriocaulon sexangulare, *Linn.*	मारगुंदिया Márgundiyá.
,, setaceum	गोंदळी Gondali.
Eriolæna Candollei, *Wall*	बोटकू Botkú, अरंग Arang.
,, Hookeriana, *W. & A.*	बूटी Búti, बोटकू Botkú.
Eriodendron anfractuosum, *D. C.*	शाल्मली Shálmali, शमीरीदा Shamiridá, भुजरीः धामण Bhújridháman.
Ervum Lens, *Linn.*	मसूर Masúr.
Erythrœa Roxburghii, *G. Don.*	लन्टक् Lantak.
Erythrina indica, *Roxb.*	पांगरा Pángrá, पारंगा Párangá.
Erythroxylon indicum, *Bedd.*	देवदार Deodár.

Eugenia aquea, *Burm.*	ठिकजांभूळ Tikjámbhúl.
,, caryophyllœa, *Wight.*	जंगली लवंग Jangli lavang, रानलवंग Rán lavang.
,, Jambolana, *Lam.*	जांभूळ or जांभूळी, Jámbhúl or Jambhúli.
,, Jambos, *Linn.*	जांबा or जांभा, Jámba or Jámbhá, साखरजांभ Sákarajambha.
,, lanceolaria, *Roxb*.......	धाकटी शेरण Dákti-sheran.
,, lissophylla, *Thwaites*..	पानजांभूळ Pán jámbhúl.
Eulophia bicolor, *Dalz*	अंबरकंद or अमरकंद Amberkand or Amarkand.
Eupatorium Ayapana, *Vent.* ...	आयापान Áyápán.
,, divergens...........	*See* Vernonia divergens.
Euphorbia antiquorum *Linn* ...	नरसेज Narsej.
,, hirta	दुधी Dudhi, नायटी Náyati, (E. pilulifera, *Linn*)
,, neriifolia, *Linn*	निवडूंग Nivaráng, निवलकांटें Nivalkánté, मिणगुट Mingut.
,, thymifolia, *Burm*...	नायटी Náyati, धाकटी दुधी Dháktidudhi, हजारहदाना Hazárdáná.
,, Tirucalli, *Linn*	शेर Sher, थुवेर Thuvar, निवल or–ली, Nival or Nivali.
,, tithymaloides, *Willd*	शेंड Shend, विलायती थुवर Viláyati-tuvar.
,, (gum)	फरबीयून. Farbiyún
Eurya japonica, *Thunb*	भौंरा Bhaunrá, गोंटा Gontá, देवरा Devrá.
Euxolus polygamus, *Moq*	चुलाई भाजी Chúlai bháji.
Evolvulus hirsutus	शंखवेली Shankhaveli, (E. alsinoides, *Linn.*)
Exacum bicolor, *Roxb*	उदीचिरायत Udichiráyat.
,, pumilum, *Griseb*	जटाली Jatáli.
Excæcaria Agallocha, *Willd*...	गेवा Gévá, फुंगली Phungali, सुरूंड Surúnd.
,, baccata, *Müll.*	कीरद Kirad.
,, insignis, *Müll-Arg*..	उरो Uro.
Fagonia mysorensis	धमासा Dhamásá (F. arabica, *Linn.*)
Farsetia ægyptiaca, *Turr.* ...	फरीद-बूटी Farid-búti.
Feronia elephantum, *Corr.* ...	कवठ or कविठ, Kavath or Kavith.
Ferula alliacea, *Boiss.*	हिंग Hing (*impd.*)
,, galbaniflua, *Boiss.* (*gunresin.*)	बिराज़् Biriz (*impd.*)
,, Narthex *Boiss.* (*gum-resin.*)	हिंगडा Hingrá.
,, sp. (*gum-resin*)...	सगबीनज़् Sagbinaj.
Ficus asperrima, *Roxb.*	खरवट or-टी Kharvat or Kharvati.
,, bengalensis, *Linn*.........	वड Var, वडी Vari.
,, Carica, *Linn*...............	अंजीर Anjir.
,, cordifolia, *Roxb.*	पैरी or पायरी Pairi or Payri, अष्ट Ashta.

Ficus dasycarpum, *Lam.* ……	भुरवड Bhurvar.
,, demonum ………………	धेडउंबर Dher-umbar, बोखेडा Bokherá, गांडयाउंबर Gándyáumbar, काळाउंबर Káláumbar (F. hispida, *Linn. f.*)
,, glomerata, *Roxb.* ………	उंबर Umbar, उदुंबर Udumbar.
,, infectoria, *Willd* ………	बस्सारी Bassári, पाकडी Pákari, उंखळी Ukhali, लेंडवा Lendvá.
,, religiosa, *Linn.*…………	पिंपळ Pipal, अश्वत्थ Ashvatha.

(*To be continued.*)

THE HORSE: A ZOOLOGICAL STUDY.

By J. H. Steel, A.V.D.

In whatever way we look at horses they are of interest and instruction. We may approach them with the critical eye of the horseman skilled in the judgment of shape, action, and pace; of the veterinarian, distinguishing the sound from the unsound; of the humanitarian, viewing with interest one of the most valuable quadrupedal friends of man. Or, again, we may approach from another point, and view the natural history relations and bearings of the noble animal, his zoological characters and affinities, and his comparative anatomy. Seen as a member of the zoological tree, the horse yields to none in the interest of the considerations it suggests to us, some of which I hope to touch on superficially this evening.

Hippology has not yet become a distinct science, but we have sufficient material at our disposal to render it so; and Xenophon probably had the intention of making a knowledge of the horse a polite study, and temporarily succeeded in doing so among the circus-loving patricians of Greece by his work on Hippologia. A Hippological Association would be out of place nowhere in the British Empire; for, somehow or other, horse racing, hunting, and the like, follow the Union Jack just as cricket does. The study of hippology from its severest and most recondite aspects has been pushed with some vigour in Germany, France, Italy, and the United States. The descent of the horse; his true place in nature; the true homology of his foot; the comparison of fossil horses, and of those of Grecian, Assyrian, and primitive art, with the horses of the present day; the strict comparison of living horses now found and their arrangements in species, races, varieties, &c., have been followed out especially by Owen in England, Gaudry in France, Rutimeyer in Germany, Kowalewski in Austria, Count

Ercolani in Italy, and Marsh and Cope in America. The results obtained by these observers and philosophical investigators of the past and of the present constitute a mass of knowledge which, if it has not yet thoroughly settled down into a well-defined stratum of scientific information, promises to consolidate into a concrete and instructive mass of science under the term hippology.

But there is a more practical branch of this science of the future (if I be permitted to call it so) which appeals to a much larger class than scientists pure and simple. In all parts of the world the horse-supply question is becoming a very large one, and presenting problems which require to be solved by those who have made the study of it a special science. The influences of artificial selection and natural causes on the form and utility of the horse is a phenomenon which we all have constantly under our eyes in Bombay, where the Arab, an Oriental horse, meets his Occidental cousin from England or Australia, and where indigenous horses (Country-breds), Turcomans, Persians, and even Burmans, are constantly to be seen and compared as to shape, value for work, and suitability for the climate.

One of the most remarkable phenomena of the last fifty years is the changes which have taken place in the distribution and nature of horses during that time. In England the thorough-bred is constantly undergoing change (in some respects not for the better), the weight-carrying hunter is becoming replaced by much lighter horses, and the older race of horsemen regret the degeneracy of horses in the present day; we still constantly hear of the falling off in horse-breeding throughout England and Ireland, and often of extinction of useful breeds, such as the Suffolk Punch, and yet we find our troops and batteries well horsed, our race horses well to the front as usual, our thorough-breds bought for high prices, because foreigners can produce none like them, and our horses "stay" in the field as well as ever, in spite of the pace in hunting having decidedly become faster of late years. Excluding the feeble attempts of the French and others to imitate the British Turf, the efforts of the Continental nations are directed almost entirely to the adaptation of the horse to war purposes. The colossal studs of Germany, Italy, France, Austria, and Russia constitute a drain on the resources of those countries which, like the conscription, has happily not yet extended to England, and from which India, with no slight effort, set herself free. On the southern and eastern outskirts of these great nations are found horses which, like their owners, have by less conscious efforts of artificial selection, indeed almost by survival of the fittest, become typical light cavalry horses, hardy, active, fleet, and fearless. The varieties of the Arab along Northern Africa and Southern Asia, from Algeria to Hyderabad (Deccan), the Cossack horse in Southern Russia, and the Turcoman in Central Asia, and extending southwards into India, are the semi-natural races now referred to. Further east we come to the zone of ponies of Indo-China and Australasia, of which the Burma or "Pegu" is an example—an essentially natural race of great hardihood, robust physique, but small size and indomitable pluck. Australia, the Americans, and the Cape show us the phenomenon of horses becoming highly specialized by the combined influences of new climate, special management, and artificial selection. Compare the Waler with the English horse, whether in shape, temper, or suitability for special work, and you will see how special influences have affected the race of horses in the colonies quite as much as they have the men. The most conspicuous example of the effects of artificial selection on the horse is the American Trotter, a grand breed with beauties of "make" and powers wholly its own, developed by Yankee energy and skill from the English thorough-bred race-horse. But I must not allow myself to be carried away by this fascinating branch of my subject. I must now point out to you that the working horse of North America, the pampas semi-wild horse of South America, the valuable "Waler," and the horses of New Zealand and the Cape are examples of diffusion of the European horse throughout the world, principally the outcome of the last half century. What an extraordinary expansion of the area occupied by the horse! This would prove an interesting study for a member of the Statistical Society, but would be out of place here.

I go on to the horses of the far distant past. Cuvier used to say that from a fragment of bone he could build up the skeleton of an animal, and he could actually do so, to an extent. A veteran *savant* of Great Britain, the illustrious Owen, has informed us from fossils what the horse of the past was like. I exhibit an enlarged copy of his diagram, from which it will be seen that his materials to work with were a few bones and teeth. He traces clearly the process by which the three-toed horse became the one-toed horse of the present day, and gradually lost the first molar in the course of time occupied in these changes. It is insisted that here we have an actual and paleontologically proved descent in the course of geological time, *i.e.*, since the upper Eocene. A remarkable confirmation of this has been contributed from America, and is well illustrated by Marsh's diagram, a copy of which I now exhibit, together with Oscar Schmidt's table showing the connection between the odd-hoofed animals. We may look at these diagrams and allow our fancy to summon before our mind's eye the time when the ancestors of our present horses roamed over the marshy plains of the continent of the old world, and were prevented by their side toes from sinking in the mud, just as are the tapirs and rhinoceroses of the present day. We may fancy that the rude pictures found carved by our own remote ancestors (on the shin bones found in fossiliferous caves) of horses and mammoths give us some insight of what these horses of the past were like, and, with Göethe, we may critically look on the vigorous representations of Grecian horses on the freize of the Parthenon, and observe that they are not like the war horses of the present day, they present anatomical indications of their being but semi-tamed and wholly natural and unartificial in development. But we must leave the domain of speculation and return to that of careful deduction! Marsh, Cope, and others have clearly proved a series of hippoid, horse-like, creatures on the slopes of the Rocky Mountains in the Upper Tertiaries; and yet when the Spaniards landed in America the horse was an unknown creature, the mounted warrior was, like the ancient Centaur, worshipped as a god! The equine animals of America had from some cause, which is at present a profound mystery, disappeared from the continent of America. Events since the discovery of the New World have tended to make this fact still more remarkable, for it has been found that both North and South America are particularly favourable to development and increase in number of horses. The question which here arises for solution in the future is; Whether the hippoid animals of Marsh were actually ancestors of horses, or rather had not mammalian development been going on on parallel lines in the old world and the new, Marsh's hippoids in America "vicariating" for horses, as llamas do for their close allies the camels, and as marsupials in the Australasian region long did for mammals of the higher orders in most parts of the world? Materials are not yet available for solution of this problem. In spite of these doubts, the value of the facts which have been ascertained concerning the descent of the horse to zoological science is proved by Oscar Schmidt's statement, that "no other mammals in the present day can show so distinct or regular a pedigree as the horse."

Teratology, the study of so-called monstrosities, gives us some curious results which are worth a short consideration in this connection. Horses are not uncommonly born with three toes on one or more of their feet. An example of this "recurrence to original type" is shown in the diagram now exhibited. Horses of low breed are especially liable to this peculiarity. History tells us that Bucephalus, the celebrated charger of Alexander the Great, was a Hipparion, *i.e.* had three toes on each foot. The tomb of this horse is on the north-western frontier of India and is well known. Whether the bones of Bucephalus still lie in it or no I am not in a position to state; but if antiquarians at any time get an opportunity of exploring the contents of this tomb, I trust that any equine remains will be submitted to examination by a competent hippologist. I also trust that the desideratum will be made widely known, in order that, if they be not already lost, the bones of Bucephalus be preserved with due honour. The results of Teratology go further—they show us that at times horses cloven-footed, like oxen, occur; that horses are sometimes found with small frontal horns; and that frequently the limb bones of the horse very closely resemble those of the ox. Natural and ordinary development shows that the fibula of the horse enters into formation of the hock joint, and that the ulna extends down to the knee, and these are facts which few zoologists know. I once had a humerus of the horse, of the large black Belgian breed used by undertakers in England, which even well-informed students in veterinary anatomy used to constantly mistake for that of a bullock. These anatomical and teratological facts by no means alter our accepted ideas as to the degree of relationship of the horse and the ox, but they are indications of similarity in function; in plain words, that the horse and ox, since they walk and run to an extent in the same way, have their limbs very similar. *They further give colour to the suspicion held by veterinary anatomists, in opposition to the views at present generally accepted among zoologists, that in the days before the Anchitherium, fusion between the third and the fourth fingers occurred to produce the large central toe of the horse.* This heresy will, no doubt, give a shock to some of my hearers who have been led to believe that the functional digit of the horse is No. 3, enormously enlarged, and that all the other digits have disappeared or are in course of disappearance. I cannot enter into detail here, but I must ask you to accept my statement that facts and observations are becoming multiplied to such an extent as to cause the hitherto accepted view to totter and to need its defenders to rally round it. Suffice it for us now to look upon the foot of the horse as a great scientific bone of contention in the future and a most beautiful piece of mechanism which ensures our horses treading firmly and progressing rapidly in the present. There are some horny portions of the limbs which are less interesting practically than the hoofs, but equally instructive and curious to the enquiring mind. The little knot of horn in the fetlock termed the Ergot is considered to be a remnant of the hoofs of the two digits represented by the splint bones. This little organ is rudimentary, *i. e.*, of no known use in the present day, and it is only found in the coarser breeds of horses. Another relic of the past, an organ in process of disappearance, is that piece of horn inside the forearm, where it is termed the Chestnut, and that inside the hock, where it is termed the Castor; it corresponds to the finger nail of the thumb of our hand and of the foot of the five-toed ancestor of the horse in the very remote past.

A lecturer on the processes of change going on in the body of mammals, whereby variation is brought about, could find no structure better illustrative of the phenomena to be described than the limbs of the horse. "Convergence," that is, similarity produced by similar uses, would be illustrated by comparing the fore limbs with the hind; "divergence" by showing how these two parts differ. The sesamoid bones of the fetlock and the navicular bone show how new bones appear and gradually increase in importance; and the splint bones, fibula and ulna, indicate the several ways in which bones disappear. *i.e.*, by degeneration, anchylosis, fusion, and developmental absorption. The shoulder girdle of the horse is a specially interesting study in comparative anatomy; of the typical three elements, scapula, coracoid, and clavicle, the former is remarkably well developed, the coracoid has degenerated into a single process of the scapula, and the clavicle has become but a fibrous band in the substance of the muscles running from the neck to the shoulder. It is a fact not known to zoologists in general that the horse has distinct indications of a clavicle, and that it is not rare to find in him rudimentary clavicular muscles. The spine of the horse is in a singular state of unrest. There is not one of its five regions that has always the same number of bones. This is a most remarkable fact and a most significant one, and, I may add, one on which zoologists have not hitherto laid sufficient stress. Darwin has taught us how much may result from individual variety and specific variation, and he could nowhere have found it better marked than in the spine of the horse. It will be sufficient if I here state that I have proved it is not unfrequently seen that the seventh cervical vertebra in the common English ass has on each side a well-developed rib connecting it with the sternum; thus this animal is, in fact, the extraordinary phenomenon of a mammal with but six cervical vertebræ. The bones of the back vary in different cases from 17 to 19; of the loins the number of bones is extremely uncertain, ranging from 5 to 7; the sacrum consists of 5 or 6, and the number in the coccyx is quite uncertain; but it has been observed that the tail in well-bred horses is becoming shorter—a fact which may comfort members of the Society for the Prevention of Cruelty to Animals with the knowledge that, in the distant future, horses' tails will have become too short to require "docking." To those who view this subject from an artistic point, and fear lest in the future the horse may lose altogether his beautiful caudal appendage, I may give a word of comfort. Instantaneous photography of horses in motion has proved that the tail has a *raison d'être* as a balancing organ; Nature also will spare it for use as a fly-flapper!

Time will not permit my passing in review the nearest allies of the horse and the various races of equines in different parts of the world. Our country-bred horses show some remarkable indications of relationship with the zebra, donkey, and quagga and other equines who are not caballine. We are constantly speaking of the donkey-stripe of the Kattywar horses and of zebra marks on the knees and hocks of country-breds. The frequency of mouse-colour in country-breds and the constant occurrence of particolouration in them are significant in this relation. Another study of equines which would prove specially interesting and of scientific value would be the phenomenon of hybridism as exemplified in the mule, the hinny, and the crosses which have been made from time to time between the horse and the zebra; not to speak of the extraordinary phenomenon which occasionally occurs of mules breeding. These hybrids promise to show to the careful student the laws of transmission of parental qualities; they afford the most practicable opening into this hitherto obscure field of enquiry. Comparative anatomy gives us some information; for example, we find that the lower hock bones are naturally becoming fixed (natural spavin) and the splint bones are becoming but processes of the large metacarpal (natural splint), but the study of hybrids tends to give us precise information as to how we are to breed the exact sort of horse that we require. It is interesting to observe that horse-breeding, which has hitherto been empirical, is showing signs of becoming a ductive science with a certain amount of exactitude in it. I trust this record of a few thoughts about horses will prove of interest to the Society.

ZOOLOGICAL NOTES.

SNAKE-BREEDING FOR THE GOVERNMENT REWARD.

THE Government of Bombay recently addressed our Society on the subject of the rewards paid for the destruction of poisonous snakes in the districts of Satara and Ratnagiri. The opinion of the Society was solicited on various points, and, amongst others, the question was raised as to whether there was likely to be any truth in the rumours that snakes were frequently bred in confinement by the people, in those districts, for the sake of the Government reward.

The following is an extract from the reply written to Government by Mr. H. M. Phipson, the Hononary Secretary, on 8th June 1887 :—

" With regard to the last paragraph in your letter concerning the possibility of snakes being bred in confinement for the sake of Government reward, I have no hesitation in saying (and in this Mr. Vidal thoroughly agrees with me) that such a thing is highly improbable.

There are practically only four poisonous snakes, of any consequence, in the districts referred to, Satara and Ratnagiri. *viz.*—

1. The Cobra (*Naga tripudians*).
2. The Gunus (*Daboia elegans*).
3. The Phoorsa (*Echis carinata*).
4. The Krait (*Bungarus arcuatus*), of which the ~~latter~~ last is by no means common in those districts.

The Cobra has, to the best of my knowledge, never been known to breed in confinement, and it is exceedingly doubtful whether the Gunus and Phoorsa which are both viviparous, could be successfully propagated except in a most carefully constructed serpentarium.

The rumours respecting the breeding of poisonous snakes are probably founded on the fact that snakes' eggs are frequently picked up by the junglemen, who naturally keep them until they hatch, so as to claim the Government reward in the event of the snakes being poisonous; but this practice is one that should be encouraged.

It is also quite possible that gravid females of the Phoorsa (which is so common in Ratnagiri) have occasionally been kept for a short time after capture in order that the Government reward may be claimed on the young ones as soon as they are born, but there seems to be little or no harm in such a practice."

District Officers frequently refer to rumours regarding the existence of such practices, and as the subject is of interest both to the naturalist and to the economist, the sooner the truth is ascertained the better.

BOOK NOTICE.

The "Marchesa," an auxiliary screw steam yacht of 420 tons, Mr. C. Kettlewell) master and owner, * * * left Cowes on the 8th January (1881) and reached Colombo April 24th, having touched at Socotra and Oolegaum Island (Maldives) * * *. She proceeded viâ Singapore to Formosa; and so far we have only quoted the author.

In a recent review we had to praise a writer for having written a readable account of the ordinary outward voyage to the East; but Dr. Guillemard has adopted a counsel of perfection (given by Horace), ignored a few thousand preliminary knots altogether, and introduced us to the "Marchesa," running in towards the land to reconnoitre a fort at Nansha, the southern extremity of Formosa. This particular fort has deserved from the first, as some of our own Isle-forts do in their old age, the favour even of the Peace Society. For it was erected not for the fracture of heads, but "as a refuge for Shipwrecked Mariners"; in virtue of a treaty concluded in 1867, between General Le Gendre, U. S. Consul at Amoy; and Tok-e-tok, Paramount Chief of the Southern District of Formosa, to both of whom the acknowledgments of mariners are due. For before that; Tok-e-tok's subjects had been in the habit of murdering all strangers on whom they could lay hands, and were more than suspected of eating them.

The "Marchesa" made no experiments upon the improvement in their ways, but passed on to the low island of Samasana, formerly visited by the famous old Samarang; and by the Sylvia (1867). Here, however, her party found nothing in our line, but many domesticated Formosan deer (*cervus pseudaxis*) creatures looking like a cross between the English red-deer and our "chital." It will strike a familiar chord in the heart of every mofussilite reader to find that here, in what our author calls "the ultimate of Ultima Thules," he was waylaid on his return to his boat, and compelled to *examine the school*, just as he would have been here. Having discharged this duty under the slight difficulty caused by his not knowing the Chinese alphabet quite so well as the junior first form did, he sailed for Chock-e-day.

The virtue of the land of Chock-e-day, which is on the East Coast of Formosa, is that its mountains rise 7,000 feet almost sheer out of the sea, as is well shown in a fine illustration. It must be one of the grandest coasts in the world, but there is not much pleasure on it, and no anchorage. A party from the "Marchesa" landed, well armed, and admired the scenery greatly; but saw only one bird (not described) and caught nothing but a snake, 9 feet long (not identified). They saw tracks of deer and wild cats, and on their return to the boats, those of a native who had been dogging them, possibly with a view to dinner. After which, the surf having risen, they had to swim off to their boat with the aid of a life-belt and line; and made no further attempt to inspect Eastern Formosa, which is entirely in the hands of inhospitable and probably Cannibal savages, and likely to remain so for some time yet.

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* *The Cruise of the "Marchesa" to Kamschatka and New Guinea;* with notices of Formosa, Liu-Kiu, and various islands of the Malay Archipelago. By H. H. Guillemard, M.A., M.D., &c., &c. London: John Murray, 1886.

They therefore proceeded to the comparatively civilized portion of the island colonized by the Chinese, landed at Ke-lung, and went overland (partly by river) to Tamsui; remarking, chiefly, the great variety and beauty of the bamboos, a thing worth noticing, as these ports lie under the 26th degree N. L. Dr. Guillemard observes that *Aralia Papyrifera*, the plant whose pith furnishes what we somewhat perversely call "rice-paper," is peculiar to Formosa, "a fact not generally known." He notes that the lofty eastern mountains of the island, catching the rainstorms of the Pacific, make it "a sort of umbrella for the eastern coasts of China"; and that the *detritus* constantly washed down from them bids fair some day to unite the island to continental Asia.

Tamsui and Ke-lung have been a good deal before the public since the "Marchesa's" visit, in connection with their occupation by the French; and it is not, therefore, necessary to quote here Dr. Guillemard's account of them and their environs. On the whole, he considered Formosa "a very good country to live out of;" and gladly departed for Liu-Kiu (which we used to call Loo-choo).

His researches in that archipelago were such as may best be dealt with by our "chum" Society, the Anthropological. The Islands, he says, "still remain an almost virgin ground" in respect of natural history; and he brought no specimen out of them to speak of, except a "large and beautifully iridescent shell (*Avricula Micropteron*) very rare on the Island, and greatly valued for its beauty." Bird life appears to be exceedingly poor in Liu-Kiu. Of plants he notices pine trees, pink lotus, and "feathery fronds of the tree-fern." It is not easy for the reader to guess whether this last is the same plant noticed a page or two further on as "the stiff-looking Cycas." At any rate, this last is extensively planted, for what purpose we are not told.* The other vegetation mentioned is all sub-tropical. The Islands, at the time of the "Marchesa's" visit, were passing under Japanese dominion, and will probably soon cease to be *terra incognita*.

She sailed from thence to Japan, and here again we have reason to be grateful to Dr. Guillemard for judicious abstention. He really only bestows a line and a half upon the "mousmis"; and a page and a half on the whole country; and leaves the reader to learn "all about it" from the works of people who have seen something more than the hackneyed excursion routes; reserving himself for the almost unknown glories of Kamschatka. With these he made his first acquaintance at Petropaulovsky in Avatcha Bay, memorable chiefly for the fiasco of the naval expedition undertaken against it by the French and English in 1854.

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* Probably Sago.

The result of their combined action is still traditionally recorded in the navy in the words of a sailor, too forcible, unluckily, for publication *virginibus puerisque*. At any rate, they got well beaten, but returned next year, and destroyed the place, which the Russians, with their characteristic strategy, had meanwhile abandoned. Dr. Guillemard thinks Avatcha Bay "one of the finest harbours in the world, if not "actually the finest;" but the town of Petropaulovsyk had not at the time of his visit, recovered from its desertion and destruction; and was simply a poor undefended *fur*-trade settlement. Fishing and shooting were good, and amongst other birds our author notices (and figures) two very quaint-looking sea-fowl, the Whiskered Puffin (*Lunda Cirrhata*) and the Tufted Auk (*Simorhynchus cristatellus*). In the latter the frontal crest curves *forward*, giving a strange air of martial swagger to this peaceable little water-fowl.

Ashore, the most remarkable and abundant mammal was the sledge-dog; who outnumbers humanity, in Kamschatka, by about 400 per cent., and is so far master of the situation that "owing to his rapacity, it is impossible to keep sheep, goats, or any of the smaller domestic animals, and Kamschatka is one of the few countries in the world in which fowls are unknown." In mitigation it has to be observed that except when actually at work, these dogs are never, or rarely, fed; and, instead of having kennels, are reduced to *burrowing* for shelter. "A dog's life," says Dr. Guillemard "is here most appropriately realized." To prevent the dogs, when collected for work, from quarrelling, they are picketed one to each foot of triangles of poles arranged like piled rifles; and this although the males are subjected, as pups, to a pacificatory operation.

A party from the "Marchesa" undertook to march overland from Petropaulovsky to the Kamschatka river, and descend the latter on rafts, floated on dug-out canoes of poplar wood; and accomplished this exploration with success. Their account of the interior is, in short, that "every prospect pleases, and only man is vile," especially when well crossed with Russian; the aborigines being, comparatively civil and honest. It is quite clear that the game was not worth the candle, and that nearly all they saw worth seeing could have been better got at by ascending the river from its mouth in their own boats.

They shot one bear and one sable (out of season), many ptarmigan, doubtfully identified as *Lagopus albus* (no specimens were preserved), Ernes (*Haliaëtus albicilla*) Phalaropes (*L. hyperboreus*) and ducks, which our author does not specify, though he appends a list of Kamschatkan birds, borrowed, with due acknowledgment, from Dr. Leonard Stejneger.

Of the ducks, however, Dr. Guillemard tells us one thing; a new way of cooking them *à la kamschatkaine*, which he recommends:—"The bird is plucked with care, so as to leave the skin unbroken: and is not drawn. A stick is thrust down the throat, and the other end stuck into the ground close to the fire. The effect produced when a party of a dozen are thus cooking their suppers is not a little absurd; it is as if the camp-fire had burst into a perfect girandole of naked ducks, who fly quacking from it in open-mouthed alarm." The party saw, but did not obtain, the fine sea-eagle of Pallas (*Thalassaëtus pelagicus*). But the most interesting record of their journey to the naturalist is the notice of the strange and numerous Salmonidæ of the Kamschatkan rivers. The number of these unhappy creatures is one of the marvels of nature. In a branch of the Avatcha 18 inches deep, "hundreds were in sight, absolutely touching one another; and as we crossed the river our horses nearly stepped upon them. * * They were for the most part foul fish * * *, but others in good condition were to be found, and with a little trouble I was able to pull out three good ten-pound fish in as many minutes with a gaff. Any other method of fishing would have been useless." A native present "went a little way up stream, and soon returned with half a dozen fish, which were a great improvement upon our own selection; for I can apply no better term to it. * * * The traveller goes down to hook his supper out of the stream as naturally as he gathers the firewood to boil his kettle."

The Kamschatkan population, human and canine, live chiefly on salmon, and during the summer so do the bears, and in winter horned cattle are foraged on them. This last curiosity in farming is known in some other countries, and we in India have seen milch and draught cattle fed on worse things. All the efforts of man, beast, and bird have no material effect upon the numbers of the fish, and the proportion consumed by all enemies is nothing to that which perishes from starvation, shipwreck, or disease, and lies in rotting heaps by the banks of almost every stream.

The commonest species is *Salmo Proteus, Kamschatkicè*, "Garbusa," which, says Dr. Guillemard, signifies "Hump-back," and certainly ought to. This fish starts in life with a good figure and a fine silvery complexion, set off by a few spots on his tail; but even before spawning his back begins to get humped, the natives say from the effect of his efforts in ascending the stream (which can scarcely be accepted as *causa vera et sufficiens*). At the same time his snout turns down and his chin turns up, and as a "kelt" he is the very Punch of the waters, while his coloration, livid, irregularly blotched with blood red, is rather that of a Clown. This is the most abundant species and least esteemed, thought eatable enough when "fresh run." It is chiefly used to feed dogs (and sometimes cattle), and runs to about 15 lbs. weight.

The largest and best fish is the "King Salmon," or "Tchervitchi," which attains a length of four feet and a weight of 50 or 60 lbs. *avoirdupois*, and is said sometimes to exceed these dimensions.

Dr. Guillemard mentions several others, and is rather perplexed about one, called Gultzi, which appeared to him to be a large char. The name is ascribed by several writers to a true Salmon (*S. căllaris*), and is probably loosely applied by the natives to two or more species. One Kamschatkán Salmon (*Onchorhynchus lagocephalus*) turns bright red all over in the "kelt" stage, *i. e.* after spawning. Another, the "Kisuchi." (*Onchorhynchus Sanguinolentus*), is so fat that the natives "try out" the oil by putting heaps of the fish in a canoe beside a bonfire, with water *quant. suff.*, and dropping red hot stones in till the water boils and the oil rises to the surface. The civilization of this Russian dependency must be rather low when the inhabitants are reduced to this very primitive sort of cauldron close to navigable rivers.

The "Marchesa's" shore-party made a survey of the chief of these, the Kamschatka, and recorded some observations about the fine group of volcanoes near its mouth, very well worth reading, and well illustrated from their photographs. The ship dared not cross the dangerous bar, though a Swedish schooner drawing 10′ 6″ had lately done so with some danger, bumping once or twice, even at high water. "It appears," says Dr. Guillemard, "that there is only one tide here in the 24 hours," a thing about which a seaman would like more positive information. The "Marchesa," however, had had enough of the place, got her "liberty-men" on board, and stood away for "Bering" Island.

Dr. Guillemard tells us that this, and not "Behring," is the proper spelling of the name which that unlucky navigator has left to the island in question, as well as to the more famous straits. It and a neighbouring one called "Copper Island" are the westernmost of the volcanic Aleutian chain that locks in the north angle of the Pacific. These two belong to Russia, and are called, together, the Komandorski (Commander) Islands, that having been the naval rank of poor Bering when he perished miserably on the larger, half-buried before the breath was out of him.

Most of the time of the "Marchesa's" party was taken up in interviewing the fur-seals, or sea-bears (*Callorhinus ursinus*); but the natural history of this animal, and the fashion in which he is preserved and slaughtered, are not only hackneyed but in many details little short of disgusting. One thing Dr. Guillemard records which is not in the newspaper accounts of the Sealery, *videlicet*, the young sea-bears are born with their eyes open. Also he met here Dr. Leonard Stefneger engaged on the natural history of the islands. The most valuable result of his researches had been the collection of many bones of the extinct sea-cow (*Rhytina Stelleri*), and of some data bearing on the very recent colonization of these volcanic isles by the continental fauna and flora. He thought that the evidence quoted by Nordenskiold as to the survival of *Rhytina* to within late generations was untrustworthy.

From Nikolsky, the capital of Bering Island, the "Marchesa" sailed to Cape Shipunsky, in Kamschatka, to hunt walruses and wild sheep (*Ovis nivicola*); with the former she did little good, the shore having been harried by the Swedish schooner already mentioned, and the carcases left lying on the rocks, effectually debarred the survivors from landing. Now walrus hunting *in the water* is no diversion for amateurs. With the sheep the landed party did better, surrounding many on a lofty promontory, where they shot or drove over the cliffs no less than nine in one day. These sheep closely resemble the American "Bighorn" (*Ovis montana*), and are fine brutes, some exceeding 40 inches at the shoulder, with a length of five feet and a half, and horns 35 inches long outside the curve.

Dr. Guillemard gives reasons for maintaining the distinction of the species, by some identified with the nearly allied *O. montana*. They have one merit considerable in a sheep, very good mutton. A few seals, resembling *Phoca vitulina*, were shot here, after which the "Marchesa" returned to Petropalousky, and sailed thence to Cape Lopatka to get sea-otters (*Enhydra lutris*). They got two skins, and the canoe, bow and arrows used in the chase of this rare animal. The canoe was like an Esquimaux kayak in form and construction, made of skins of the sea-lion (*Eumetopias*) on a wooden frame, covered in, and further protected by a loose petticoat-shaped circular apron tied under the arms of the paddlers. One of these canoes can be lifted with one hand (though they hold three men); and in foul weather (as they always cruise in company) they are made fast to each other by means of paddles seized down athwartships, forming a pretty sea-worthy sort of catamaran.

The bow is mentioned as of "tough wood," un-named, strengthened by an outer longitudinal bracing of plaited hide such as is used by the tribes on the American coast of the same sea to *make up for the want of toughness* in the coniferous woods on which they have to depend. The arrow is of wood, with a long socket of walrus ivory, which loosely holds a barbed copper head, made fast to a lanyard of plaited sinew coiled on the shaft, very much as in the fishing arrows of our own Bhils. The feathers are "rifled," *i.e.*, set on spirally to give a spinning motion to the projectile; a practice which is reported to exist, or to have existed, amongst some tribes in the north-east of the Indian peninsula.

From this point Dr. Guillemard, with his usual discretion, gives us a mere précis of the "Marchesa's" movements in well-known waters, till we rejoin her at anchor off Lamery, in the isle of Luzon, 40 miles south of Manilla. Near this place is the lake of Taal, mountain-girt, and probably an extinct crater, 15 miles long. In its centre rises a mountainous island 2,000 feet high, on the top of which is an undoubted crater-lake a mile across. The "Marchesa" stayed only a few hours, and sailed for the Sulu sea. Passing the little isle of Bancoran, it was observed to swarm with big white "nutmeg pigeons" (*Myristicivora bicolor*), which tempted the travellers in vain. Time pressing, they proceeded on their voyage to Cagayan Sulu. This island lies pretty well in the centre of the Sulu sea and clear of the other islands known by the same name; it acknowledged the suzerainty of the Sultan of Sulu, subject always to the necessity of submitting to that of Spain, whenever and so long as enforced by the arms of that power. This seems to have been the condition of politics throughout the Sulu group at the time of the "Marchesa's" cruise, viz., 1883.

Dr. Guillemard thought he had never seen a tropic island "more captivating than Cagayan Sulu." The party explored it for several days; especially a strange chain of three crater-lakes, side by side on the south coast. The sea has broken into the westernmost and largest lake, Jiwata; but the entrance is only about a cable's length across and 3 feet deep, though inside there is 55 fathoms. It is also partly barred by an islet, a remnant of the crater's rim. The other two lakes contain fresh water; and it is impossible to look at the plan and sketch, illustrating Dr. Guillemard's account of them, without hoping that a civilized engineer may some day have the chance of cutting through the coral barrier and lava-bar of Jiwata; and turning it into one of the sweetest little harbours in creation; with a good water supply close by. Until that happens, however, there is a good harbour available on the north coast, discovered by our voyagers, and somewhat prosaically christened by them "Yacht Bay." It has a sandy bottom, and 15 fathoms water; but is not further described in the work under review. "Animal life appeared singularly meagre" in the island; but they got a new *Mixornis*; a large and very rare fruit-pigeon (*Carpophaga Pickeringa*); and some better known birds. The mammals appear to be rats and one monkey, the "krah" (*Macacus cynomolgus*) a common Bornean species.

Here there is a gap in the narrative, which is practically resumed at Meimbun, in the island of Sulu proper. Here they made acquaintance with the Sultan, whose authority is apparently nominal, and with many birds, including a green parrot (*Tanygnathus burbidgei*), peculiar to the Sulu Isles; and an almost new sun-bird (*Cinnyris juliæ*) discovered in Mindanao by the "Challenger's" party. A white cockatoo (*Cacatua hæmaturopygia*) has the under-tail-coverts and vent scarlet; a single rose-coloured feather forms its crest; and it is, says Dr. Guillemard, "perhaps the commonest bird." Fancy a country where "the commonest bird" owns such a figure and coloration as this cockatoo, *and is also good in pie* !'

The Spaniards had a fortified port in the north of Sulu, which is marked by that name in our charts; but they called it Jolo. Either name is preferable to one now happily obsolete: "Soog."

It does not appear to be a pleasant place, and gentlemen walking outside the palisades without escort are apt to get their heads chopped off with a "parang." This is a common word and weapon throughout the Eastern Isles; but the Sulu pattern, which Dr. Guillemard figures, deserves special notice. It very much resembles a Ghorkha "kukri" out of curl; and still more the curious short sword shown in some of our Indian Buddhist paintings and sculptures; which has sometimes, owing to the indistinctness of the latter, been compared to the short broadsword of classic warfare.*

Besides their eternal war with the Spaniards, the natives of Sulu are engaged in continual local, tribal, and individual feuds; and our author thinks that most of them would die in their boots if they had any. All parties treated the "Marchesas" as neutrals and guests; but on one occasion one of them, probably mistaken for an "orang Castillan," (Spaniard) was actually stalked by a native with a "parang," whom, however, his countrymen undeceived and quieted. The principal wild mammal of the island seems to be the pig (species not noted); and the Sulus showed our voyagers good pig-sticking. Of game birds they seem to have noticed chiefly *Gallus bankiva*, (the universal Jungle-cock of the farther east and probable ancestor of our Game fowls) and *Excalfactoria chinensis*, which Dr. Guillemard calls a button-quail; wrongly, of course, (if he has rightly identified his bird) *E. chinensis* is the "Blue-breasted Quail" of Indian sportsmen; our button-quails belonging to the genus Turnix, which has no hind toe; and as these names were adopted by Jerdon, whose English nomenclature was as systematic as his Latin, they have a right to stand. If size was the only thing to consider, *E. minima*, the Dwarf-Quail of Celebes, would put both the Indian birds, as well as the present species, out of court. It is the smallest game-bird in the world. Speaking generally, our voyagers found the fauna of the Sulu group to be Philippine in character, and Dr. Guillemard attributes to the Sibutu passage, separating them from Borneo, an importance, as a Zoological boundary little inferior to that of "Wallace's" line at the Lombok Strait, at the other side of the Malayan region.

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* *Vide* for instance plate 37 of Fergusson's Indian and Eastern Architecture; representing a relief from Amrawati; and note that Amrawati was in constant communication with the Malay Islands.

From Sulu the "Marchesa" sailed to the territories of the British North Borneo Company, Brunei, and Sarawak. They were not able to visit the caves where the edible swallows-nests are procured in such quantities as to form "by far the most important" export of the country. Dr. Guillemard notes, however, that the caves are not the only habitat of this swallow. He "observed a couple of nests built close together on the face of a small cliff, barely 10 feet from the sea-beach." He does not name the species, and no bird of the genus (*Collocalia*) appears in his appendices. The party collected many birds, and a live ourang-outang, but met with no particular adventure in Borneo, except that our author found a bird as big as a goldfinch (*Mixornis Bornensis*) caught in the web of a forest spider (*Nephila*) who, "though evidently somewhat deterred by his unusually large capture and the violent shakings of the web, showed no intentions of flight, and quietly watched the issue of events close by." The masculine gender is perhaps here misplaced. It is probable that no *male* spider, even of the monstrous genus *Mygale*, which Dr. Guillemard found reaching 3″ by 1″ in size, could kill a bird. The female is the bigger, as well as better, half, among the Arachnidæ; and in some species carries woman's rights so far as to kill and eat her undesirable admirers.

After some cruising in known waters the "Marchesa," on the 9th August, anchored off Sumbawa; and entered on the study of the Australo-Papuan region, to which that island belongs by climate and zoology, though the population is of the Malay breed. The difference in landscape struck the travellers at once, everything was dry, the jungle scrubby and thorny, and Euphorbias of two or three species were abundant. In Bombay we don't require to go to the Papuan region for these luxuries; but Dr. Guillemard had been for months in Malay proper, and had come to feel that nothing but a rattan had any business to stop his way with prickly branches. "The forest trees were unfamiliar, and owing to the leaflessness of many of them, there was a remarkable absence of colour in the landscape. Here and there only a Bombax caught the eye; its crimson flowers conspicuous at the end of the bare branches. The prickly-pear was growing everywhere, and to judge from its abundance, must have been introduced into the island many years ago. No rain had fallen for five months, and the heat and dust were intolerable." From the above quotation it will be gathered that the glories of Sumbawa are pretty much such as may be enjoyed by the aid of the G. I. P. R., and without getting out of range of ice and pomplets.

The birds, however, were a little more interesting from the mixture of Indian and Malayan forms; and one new bird, *Zosterops Sumbavensis*, was obtained. At Bima, in this island, the best shooting was about the town graveyard.

From Sumbawa the "Marchesa" sailed to Gunongapi (or fire-mountains), a volcanic isle, where her collectors secured a new button-quail (*proper*) which they called *Turnix Powelli*, after one of their party. They also noticed a species of *Borassus*; not so common, says Dr. Guillemard, in the islands further west, which flowers but once, and dies immediately afterwards, like the bamboo and some other big endogenous plants.

From Gunongapi they sailed for Macassar in Celebes, where they found "dress-coats *de rigueur*, but a frock-coat or even a cut-away may be worn without a breach of decorum." This compendium of Macassarian costume is, as Mr. Mathew Arnold would say, slightly wanting in lucidity; and our author saw nothing of the "incomparable oil, Macassar," which is reported to be made of the fruit of a tree very common about Bombay, the "horse-radish tree" (*Moringa pterygosperma*, Marathicè *Shewga*).

If there is no oil, however, there is lots of grog; "Port, Madeira, Hollands, and Bitters," and Manilla cheroots abound. "The ladies are far in advance of their Anglo-Indian sisters"; for why, because they wear "sarongs" and "Kibayas," things which the present writer fears to discuss. But from the context it would seem that if the Holland-Indian sisters *advance* much further on this line, their progress will be something like that of the Irish sergeant's squad "advance three steps backward, and dress by the gutter"; a dressing-room appropriate enough to any further change of costume in the direction indicated.

Amongst the Batavian disciples of Pantagruel and Lady Harberton Dr. Guillemard picked up a new trick in his own trade, a prophylactic against cholera; which at any rate, sounds pleasanter than our old friend Mr. Hornaday's "fever-cure" based upon strychnine at the rate of two ounces a week). "Float your liver, sir, keep your liver constantly floating in champagne," was the prescription of those whom our author naturally calls "the wise Dutch."

He might also well call them the liberal and hospitable Dutch; and they lent the "Marchesa" good charts, the height of friendship amongst seamen. She naturally, cruised a good deal about Celebes, and Dr. Guillemard admired the Dutch colonial system, and compared it with English ways, which he considers inferior. Leaving his generalisations on subjects clearly beyond his competence, it is a pleasure to accompany him on his proper ground—amongst the birds. In Celebes these are numerous and interesting, few more so than a dwarf dove (*Ptilopus melanocephalus*), one of many such in the Papuan region, but distinguished by shining green body and French grey head; velvet black nuchal patch, bright yellow throat and vent; and under tail coverts of crimson. He also procured *Prioniturus platurus*, a racket-tailed parrot, of a genus peculiar to Celebes and the Philippines, and on the small island of Talisse two fine species of fruit pigeons (*Carpophaga*) in which he noted the enormous power of gape (due to the peculiar arrangement of the mandibles and quadrate bones) which enables these birds to swallow entire fruits much bigger than their own heads. Returning to the main island of Celebes, the "Marchesas" shot some Babi-rusas, strange pigs whose extraordinary hornlike development of the upper canine teeth has earned their Malay name. "*Babi*" means a pig in Malay; and "*Rusa*" a deer. The latter word we have adopted into scientific Latin as the name of a genus of which the first specimens came from Malayana; though its finest species, the Sambar, is Indian.

They also got some pigs of a species unnoted, and had a great hunt for "Maleos," *i.e.*, Megapodes, or "Brush-turkeys" (*Megacephalon maleo*). These birds, which sometimes weigh over 3½ lbs. lay their large eggs in the sand of the sea-shore, like turtles, at which operation our sportsmen surprised them, and found that if they advanced with great speed and demonstration the poor "turkeys" flew into trees and sat there to be shot down in succession. But if slowly approached they ran off into the jungle before giving a shot. The genus is Australo-Papuan, and Dr. Guillemard agrees with Mr. Wallace in considering its extension to the Nicobars as due to human agency. Another westernmost form was a brush-tongued lory (*Trichoglossus ornatus*). The genus is strong in Papua and Australia ; and one species (*T. pumilus*) is one of the various "love birds" of our aviaries.

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* The natives asserted that the Babirusa could ascend trees (easy trees of course) and the "Marchesa's" hunters actually saw one try to do so.

The party procured two specimens of the Sapi-utan (*Anoa depressicornis*), which is not a monkey, but a forest-bull (as the Malay name implies); and left Celebes for Ternate. Here, in the aviary of a Dutch District Officer, they were introduced to many Papuan birds which, at a later period of the voyage, they were to see at liberty.

One of the strangest of these was the heavy Black Cockatoo (*Microglossus aterrimus*) the only bird whose beak is strong enough to crack "kanari nuts"; and another the strangely vulturine parrot *Dasyptilus Pecqueti*. There were birds of Paradise too, but no reviewer has space to quote the eloquence with which the sight of these lovely creatures alive inspires the dullest traveller.

From Ternate the "Marchesa" sailed to Batchian and Obi ; where the thing best worth mentioning, perhaps, was a racket-tailed king-fisher (*Tanysiptera obiensis*). It is strange how this peculiar form of tail-feather hangs about the skirts of the Malayan region, occurring in birds of very various diet and habit, from India to New Guinea. Another bird peculiar to the group, *Lorius, flavo-palliatus*, was shot while feeding on wild figs. It is "crimson and olive, with a splash of golden-yellow in the centre of the back," whence the name. The Malay hunters carry valuable spoil of this sort slung across their breasts, a good plan, as a light bird so carried would probably suffer little damage to its feathers.

On a small island called Bisu they obtained the Nicobar pigeon (*Calœnas Nicobarica*) which, says Dr. Guillemard, is generally distributed, yet rare, in the Eastern Isles. Its somewhat helpless bulk and terrestrial habits (in accordance with which its appearance is very gallinaceous) induce it to prefer remote islets unfrequented by man and other predatory mammals.

In this group they got their first birds of Paradise, the "Standard-wing" (*Semioptera Wallacei*) ; the only Paradiseid found out of the Papuan Islands, as restricted, and extremely aberrant from the rest of the family.

They also assisted at a deer-hunt, which seems to have been a scramble of many men and "pie" dogs; and saw sago being made.

On leaving Batchian, they touched at the desolate Weda Islands to shoot Nicobar pigeons, and saw none, but got many other pigeons, including *Carpophaga Myristicivora* "hitherto supposed to be confined to New Guinea and the true Papuan Islands" (page 247) and described as of "shining green plumage." It is not to be confused with *Myristicivora bi-color*, mentioned on page 2 of the same volume, which is mostly white and Bornean in habitat. They got a new red lory (*Eos insularis*) ; and a fine coloured plate of him is the frontispiece to the second volume. But the Weda isles have no anchorage, and the party had to re-embark, and sailed for the New Guinea group. Here they remained until December, collecting birds of Paradise chiefly ; and other things too numerous to mention, and then returned home by way of Sulu.

The book is throughout extremely interesting; and about as well got up as any book of its size and class has ever been. Many of the illustrations are extremely beautiful, especially the studies of trees. There is a double-barrelled sketch of jack fruit (*Artocarpus integrifolia*) at page 6 of the second volume; which for truth and beauty is very much to be preferred to the living fruit; and has the further advantage of not smelling nasty, as that does.

There is but one thing to regret about " the Cruise of the Marchesa," *videlicet*, that none of the ship's company seem to have thought it worth while to notice any *fish* which did not lend itself to being "selected" with a gaff out of half a yard of water, except by eating it.

PROCEEDINGS.

List of contributions acknowledged at the Meeting held on 10th January 1887, omitted in the last number :—

Contribution.	Description.	Contributor.
2 Birds of Paradise	Paradisea apoda	H. H. the Maharaja Holkar.
1 Monkey (alive)	Macacus radiatus	Mr. A. S. M. Ritchie.
1 Manura (alive)	Paradoxurus musanga	Do.
Shark Jaws	Bombay Harbour	Mr. Higgins.
A Manaul Pheasant	From Simla	Mr. H. W. Barrow.
6 Snakes	From the Dangs	Mr. F. Gleadow.
30 Lizards	Do.	Do.
1 Hamadryad	Ophiophagus elaps	Capt. A. Gwyn.
Birds' Eggs	From Shevaroy Hills	Mr. Mahon Daly.
1 Octopus (alive)	Octopus vulgaris	Mr. H. Killen.
2 Snakes	From Alibag	Mr. W. F. Sinclair, C. S.
3 Bats	Do.	Do.
1 Dolphin	Sotalia plumbia	Do.
3 Snakes	From Perim Island	Capt. W. Aves.
Scorpion and Centipedes	Do.	Do.
A large collection of Fish	From the Red Sea	Do.
A collection of Butterflies	....	Col. C. Swinhoe.
3 Eagles	From Afghanistan	Mr. J. A. Murray.
2 Snakes	From Persian Gulf	Do.
A collection of Plants	From Scinde	Do.
1 Cockatiel	....	Victoria Gardens.
1 Gazelle	Gazella Bennetti	Do.
A collection of Plants	From S. India	Mr. F. Murray.
1 large Turtle	Chelonia Virgata	Mr. J. C. Anderson.
1 Red Parrot	From Singapore	Mr. M. Hakim.
2 Snakes	....	Mr. F. Kirby.
1 Snake	From Kennery Island	Mr. W. F. Sinclair, C. S.
A quantity of Coralines and Marine Animals.	From Alibag	Do.
2 Jackals' Heads with Horns	....	Mr. F. N. Davur.

MINOR CONTRIBUTIONS.

From Captain Raffin, Captain Street, Mr. F. Kirby and Captain Gissin, R. N.

CONTRIBUTIONS TO THE LIBRARY.

Magazine of Natural History, Vol. XVIII., Nos. CVII. and CVIII., from Mr. H. Littledale; Two Years in the Jungle (Hornaday), from Captain Connop; Useful

Plants of the Bombay Presidency (Dr. Lisboa), from the author; Journal of Comparative Medicine and Anatomy, Vol. I.; Journal of the Brookeville Society of Natural History, Nos. I. and II.; and Proceedings of the Linnæan Society of N. S. Wales, Vol. I., Part III.

List of contributions acknowledged at the Meeting held on 7th February 1887, omitted in the last number :—

Contribution.	Description.	Contributor.
1 Coco-de-mer	Lodoicea Seychellarum	Capt. A. Moore, R. N.
1 Bird of Paradise	Paradisea apoda	Mr. Jamsetjee C. Jamsetjee.
3 Flamingoes	Phœnicopterus roseus	Victoria Gardens.
2 Tortoises (alive)	Testudo elegans	Mr. W. S. Price.
Ceylon Leaf Insects	Mantis ficcifolia	H. E. Rear-Admiral Sir Fred. Richards.
1 Snake	Lycodon Aulicus	Mr. F. Kirby.
A quantity of Shells	From the Andamans	Sergt.-Major Webb.
1 large Chameleon (alive)	Chameleo vulgaris	....
1 Wolf (alive)	From Aurungabad	Mr. F. Rose.
2 Owls (alive)	From Neemuch	Capt. M. B. Salmon.
Fresh-water Sponges	From Kurrachee	Mr. J. A. Murray.
1 Rock-horned Owl (mounted).	Bubo Bengallensis	Do.
A quantity of Butterflies	From Raipur, C. P.	Mr. J. A. Betham.
A number of Rats	From Sholapur	Mr. H. T. Silcock, C.S.
Carolines	From Bombay Coast	Mr. Framjee N. Davur.
A collection of Shells	80 Specimens	Miss Etta Sterndale.

MINOR CONTRIBUTIONS.

From Mr. C. E. Crawley, Mr. W. W. Squire, Mr. F. D. Parker and Mr. W. J. Essai.

CONTRIBUTIONS TO THE LIBRARY.

Magazine of Natural History, Vol. XIX., No. CIX. Mr. H. Littledale.

List of contributions acknowledged at the Meeting held on 7th March 1887 omitted in the last number :—

Contribution.	Description.	Contributor.
A collection of Sea Shells	150 Specimens	Mr. G. A. Kittredge.
1 Stinging Ray	Trygon Uarnak	Mr. F. A. Little.
1 Cobra (alive)	Ptyas mucosus	Victoria Gardens.
1 Four-horned Antelope	Tetraceros quadricornis	Do.
2 Young striped Hyæna (alive)	Hyæna Striata, from Amraoti.	Rev. R. W. Metcalfe.
A quantity of Fish and Marine Animals.	From Alibag	Mr. W. F. Sinclair, C. S.
1 Mounted Head of the Tahr.	Hermitragus Jemlaicus	Mr. H. Bicknell.
A quantity of Shells	....	Do.
1 Kite (alive)	....	Mr. J. S. Agran.
1 Snake's Skin	Daboia elegans	Mr. G. F. Sheppard, C. S.

MINOR CONTRIBUTIONS.

From Mr. R. Baumbach, Captain Bishop, Mr. V. St. J. Cabral, Mr. J. C. Anderson, Mr. H. E. Andrews and Mr. R. Hemming.

CONTRIBUTIONS TO THE LIBRARY.

Bulletin of the California Academy of Science, Vol. II., No. V; Record of the Geological Survey of India, Vol. XX.; Verhandhengen des Zoologisch Botanischen; Gesellschaft in Wien XXXVI., Band III., IV. Quartal; Journal of Comparative Medicine and Surgery, Vol. II., No. I.; Life of Frank Buckland (Bompas), by Mr. E. C. K. Ollivant, C.S.; Sport in India (Aberigh-Mackay), by Mr. J. A. Murray; Annals and Magazine of Natural History, by Mr. H. Littledale.

EXHIBITS.

Mr. G. W. Vidal, C. S., sent a collection of snakes on loan, consisting of 40 speciments; Mr. E. L. Barton exhibited a rug made by him out of 15 Afghan fox skins.

Mr. H. M. Phipson announced that through the generosity of a dozen of the members, the Society had been able to purchase, for the sum of Rs. 150, the splendid pair of Ovis Polii horns which had been exhibited in their rooms.

The usual monthly meeting of this Society was held on Monday, the 4th April 1887; Dr. D. MacDonald presiding.

The following new members were elected:—Major R. C. Græme, Mr. R. A. Willis, Mr. A. J. Haslam, A.V.D., and Mr. B. W. O. Thompson.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged the following contributions to the Society's collections:—

Contributions during March 1887.

Contribution.	Description.	Contributor.
60 Birds' Skins	From Dharangaon	Mr. G. Hampton.
1 Rock-horned Owl (alive)	From Hurda, C. P.	Mr. B. W. O. Thompson.
A collection of Birds' Eggs	392 Specimens	Mr. H. M. Gibbs.
1 Double-barrelled Rifle by Daw.	Originally made for Major John Jacob, C.B.	Do.
1 Bat	From Mozambique	Capt. Frohawk.
A quantity of Corals	From the Laccadives	Mr. M. C. Turner.
1 Ostrich	....	Victoria Gardens.
1 Black Buck	....	Do.
1 Monkey	....	Do.
1 Indian Screech Owl (alive)	Strix Javanica	Mr. J. Malcolm.
20 Crocodile Eggs	Crocodilus Palustris	Mr. E. L. Barton.
Several Snakes	....	Col. Kincaid.
1 Snake	Chersydrus Granulatus	Mr. T. Bromley.
2 Sambur Heads	....	Mr. E. T. Leith.
3 Snouts of Saw Fish	P, Antiquorum	Do.
1 Snake	Tropidonotus Plumbicolor.	Dr. Gaye.
1 Owl (alive)	Strix Javanica	Mr. C. F. Davar.
4 Young Dolphins	Neomeris Kurrachiensis	Mr. W. F. Sinclair, C.S.
A quantity of Fish and Marine Animals.	From Alibag	Do.
A quantity of Lizards, Snakes and Scorpions.	From Burmah	Mr. A. T. Webb.
1 Fish (mounted)	Barbus Malabaricus (16½ lbs., caught at Poona).	Mr. H. M. Phipson.

MINOR CONTRIBUTIONS.

From Mr. H. T. Hatch, Captain F. B. Peile, Mr. H. Tootill and Mr. Percy Benn.

Exhibits.

Mr. E. L. Barton exhibited 3 heads of Sambur, Neilghai and Panther, mounted by him for members of the Society up-country. Mr. H. Bicknell also exhibited a handsome rug made of the skins of the Silver Fox.

Contributions to the Library.

Journal of the Asiatic Society of Bengal, Vol. IV., Part II., No. IV.; Proceedings of the Linnæan Society of N. S. W., Vol. I., Part IV.; Notarisia (of Venice) Nos. I to V.; Magazine of Natural History, Vol. XIX., No. III., from Mr. H. Littledale

In the place of the ordinary monthly meeting, on 2nd May 1887, an exhibition of *orchids, lilies, begonias and other choice plants* was held.

The following are the names of the Exhibitors:—

Mr. W. J. Best.
Mrs. Douglas.
Mr. A. S. Panday.
Mr. M. C. Turner.
Mr. J. K. Johnson.
Mr. Chubildas Lulloobhoy.
Mr. Cowasjee Dady Limjee.
Mr. D. M. Slater.
Mr. Walter Lang.
Hon. Mr. Justice Birdwood.
Mrs. Chambers.
Victoria Gardens.
Mr. Furdoonjee Merwanjee Banajee.
Mr. N. S. Symons.
Mrs. Grattan Geary.
Mr. L. R. W. Forrest.
Mr. H. Knott.
Mr M. R. Wyer.

THERE WAS NO MEETING IN THE MONTH OF JUNE.

JOURNAL
OF THE
BOMBAY
Natural History Society.

No. 4.] BOMBAY, OCTOBER 1887. [Vol. II.

WATERS OF WESTERN INDIA.

PART IV.—GUJARAT—(*continued*).

(*By a Member of the Society.*)

THE seas of Gujarat, as has been shown above, resemble towards the south those of the Konkan ; and northwards belong to the Sind maritime region, so I need spend no time or ink on them.

In the freshwaters, as hitherto, the only important mammal is the Otter (*Lutra nair*). In the matter of birds, the difference between these waters and those hitherto dealt with is very great. We have here got to the edge of the tropical region, and while we have nearly all its Indian forms, the cold weather brings us many of the Palæarctic birds.

Of the Aquatic Raptores, the chief is the Ring-tailed Sea Eagle *Haliaetus fulviventer* (*leucoryphus*), closely followed by the Osprey. The former certainly breeds here in the rains, but I have not found an Osprey's eyrie. The Ring-tailed Eagle preys at certain seasons at least as much on water-fowl as on fish, its chief victims, the countless bald coots, being much inferior both on the wing and in the water to ducks, are a comparatively easy prey ; and I have seen, on an island of the Nal, a space of many square yards strewn six inches deep with their feathers, around an old acacia which the eagles used as a dining-room, or, as falconers call it, a " block. "

The Osprey, on the other hand, seldom touches feather.

The Brahminy Kite, a bird much less restricted in matters of diet than his human godfathers, is also abundant; and *Spilornis cheela* is found in the eastern woodlands, often near water, but by not means confined to its neighbourhood. The birds of prey of this region seem to require a little more attention than they have hitherto received, but I do not myself think that they will be found to include any forms not found in either Khandesh or the desert region. I have not met with the grey-backed or the white-tailed Eagle on the freshwaters.

Limnaetus Cristatellus is not uncommon in Eastern Gujarat, but in spite of its watery name it is not a water eagle but essentially a forest bird.

One fish Owl (*Ketupa*) occurs in the eastern streams, probably in greater numbers than might be supposed from the scanty record as yet published.

The Great Blue Kingfisher (*H. Leucocephalus*) haunts similar waters. The other two Blue Kingfishers (*H. Smyrnensis* and *Alcedo Bengalensis*) and the Pied Kingfisher (*Ceryle rudis*) abound, but the region is not generally favourable to the rarer species that belong to or approach the Malayan fauna.

Of Cranes we have three. The huge Sarus is a permanent resident, and a familiar object, as few people ever molest him. In one flock of these cranes, which I had repeated opportunities of watching there was a half-grown bird who used often, and of his own accord to swim short distances. The common and demoiselle cranes are cold-weather visitors, coming in huge flocks, especially to the north-western plains. They roost in great numbers in certain marshes on the edge of the desert; and as they fly eastwards in the early morning over the cultivated lands, they seem like an aërial army with banners and trumpets. Each corps keeps clear of its neighbours, but the whole army advances almost in line, and sometimes the flanks are out of sight on each horizon. But the whole force seldom takes more than a few minutes to pass. These two species are eagerly pursued, but generally take very good care of themselves.

All the southern species of Plovers are abundant here. Of the more northern Vanellinæ (or Lapwings proper), *Chettusia gregaria*, the Black-sided Lapwing, occur in small flocks, and Captain Butler mentions the White-tailed Lapwing (*C. leucura*). Both the "Did-ye-do-its" are common; and both Stone Plovers occur in suitable places, and breed. For the certainty of this, in the case of the Great Stone Plover, I am indebted to Mr. Littledale's paper in the fourth No. of this Journal. I have myself seen the bird all the year round in this region, under circumstances which induced me to believe it a native; but I have not got the nest. This is by no means my only obligation to Mr. Littledale and his collaborator, Mr. Doig.

The Turnstone, Crab-Plover, and Oyster-Catcher occur on the coast, and probably breed there.

The Snipes are the same as in the regions already treated of, "only more so," or at least more of them. The Woodcock Wood Snipe may occur in the Dangs.

The Black-tailed Godwit is common in the cold weather; its ally, the Avoset Sandpiper, rather rare. Of the Curlews, the true curlew is commonest on the coast; the Whimbrel is far more so inland, and usurps its name in the sporting vocabulary of Gujarat. The Stints are numerous, especially on the coast. One species (*Tringa minuta*, I think) is fairly abundant in sandy river-beds, even of moderate size. For instance, I have found large flocks on the Wát-ak, near the famous tomb of the Sayads, above Mahmudabad. Small as they are, the Stints are well worth powder and shot, being, for the table, barely inferior even to Snipes. Sandpipers are very common; the Greenshanks and both Redshanks hardly less so. *Totanus calidris*, in a few places, occurs in immense flocks, especially towards evening, when scattered foraging parties unite, and fly towards a common roost.

On one occasion, finding out their path to bed, I shot in a few minutes enough to supply a large camp and might have killed many more. The Stilt is common, and the Avoset not rare in suitable places; but the great abundance of Ducks and Snipe causes the sportsmen of Gujarat to overlook almost all other water-fowl; and they really know less about them as a rule than the shikaris of less favoured land, who are obliged by necessity to be less "proudful," and know something about eatable "Snippets."

Of the Latitores, both Jacanas are common, and both breed. The Rails and Water Hens are very numerous, and as yet by no means worked out. I have little reliable information about them myself. The Purple Coot and Bald Coot abound and breed. The former, as seen strutting on the grass near the edge of a tank, with the sun on its plumage, is a splendid bird, looking like a great blue pullet. In hand its size shrinks, the plumage seems rather sooty, and it is only second-rate as a table bird, and can take no rank in presence of so many better birds as we find here.

Of the Cultirostres, we have the great Adjutant and the handsome "Jabira" (*Mycteria*).

The European Stork is a winter visitor, the Black Stork rare, and, as elsewhere, confounded with the black White-necked Stork, which is very abundant.

The Herons are abundant. On one occasion I saw a bird which I took at the time for *Ardea sumatrana*, but the observation is doubtful. The grey Purple Herons, the various white Egrets, and the whole tribe of Paddy-birds, swarm in suitable places; the European Bittern is not uncommon in the cold weather and at least one little bittern still less so. Mr. Littledale mentions this as *A. flavicollis*, but it is probably not alone.

I have often seen various herons associated with crocodiles upon (apparently) the most friendly terms, and once a white Egret (*H. minor*) appeared actually to pick something off the reptile's side, probably a leech or some parasite.

The Spoon-bill is common, usually associated with the White Ibis. The Glossy Ibis occurs in considerable flocks; and the Black Ibis in smaller parties, but more frequently. This bird is here often a very foul feeder. The Pelican Ibis and Shell Ibis abound. The three last birds all perch on trees; but I have not seen the Glossy Ibis do so; and the White Ibis not often, except at night.

Of the true Natatores, the first is the Flamingo, which abounds in places in the cold weather, remaining as late (occasionally) as June. I have not, however, found it breeding. (Where *does* it breed?)

The typical Wild Goose, *A. anser*, occurs in the cold weather, especially in the north-western districts bordering on the desert region. The flocks are infrequent, and usually small, and the habits of the bird appears to be rather nocturnal, so it is but seldom shot. No other species of Anser (as restricted) has yet been recorded The Nukta or Black-backed Goose (*Sarkidiomis melanonotus*) is common, and breeds. The other resident *Anatidæ* are the Lesser Whistling Teal, the Cotton Teal, and the Spot-billed Duck. This last is commonly called in Gujarat a Mallard, and is, indeed, very closely allied to the European Mallard, which may perhaps occur in Gujarat as a rare straggler. I have not seen it there myself.

The Brahminy Duck is common enough, and stays late; but does not, I think, breed here. The Sheldrake (*Tadorna vulpanser*) is rare. The Shoveller abounds, but is here little esteemed by sportsmen, because of its familiar habits. It may commonly be seen daddling in dirty little puddles besides villages, almost as tame as the Pea-fowl, and not much more particular in its diet.

The Pink-headed Duck of Bengal probably does not occur. The Gadwall, Pin-tail and Wigeon are abundant; the last two in larger flocks, and more locally distributed than the first. The common Teal and Garganey abound, and the latter remains later than any other migrant duck, quite up to the end of April and even the beginning of May. The birds just named, with the Spot billed Duck and White-eyed Pochard, are the ducks most commonly found in the bag in Gujarat. I have shot the Marbled Teal in Gujarat and Kattywar, but it is a rare bird. The Red-crested and Red-headed Pochards both occur; but being powerful and wary birds, and affecting the wider waters, are less commonly shot. The Scaup may occur as a straggler, and the Tufted Pochard is locally common, especially towards the N.- W. Frontier.

The Merganser and Scaup are rare stragglers, as is the Crested Grebe. The Dabchick is common all over India wherever there is water. The Gulls and Terns, very abundant in some places, are the same as those of the Sind region, and are mostly recorded by Captain Butler. I am surprised, however, to find *S. javanica* not noted as a Gujarat bird in his list, as it is not uncommon on the Subarmati or Ahmedabad river. I have not seen the Skimmer (*Rhynchops albicollis*), but I think it has been obtained on the large estuaries.

The Lesser White Pelican is not uncommon in the cold weather; and I think that the European Pelican will probably be found to occur at least as a straggler. The Grey Pelican is common, and breeds. The rivers of Gujarat sometimes flood very rapidly, a sort of wall of water pouring down the dry bed, and on the crest of this, or little behind it, amidst a confusion of drift and muddy foam, the Grey Pelican may often be seen looking almost the spirit of the deluge.

The Great Cormorant is rare, the lesser and little Cormorants are common; and the last a permanent resident, as is the Snake Bird. Of all lands that I have shot in, Gujarat is the best for wild fowling in a modest way. The number and variety of birds is less than in many other places, but still sufficient to satisfy any reasonable sportsman. The multitude of tanks, and the great variety in their size, enable a busy man to get a few brace of birds in an hour's walk with little apparatus and arrangement; and this to a resident sportsman is worth far more than the power of making a big bag at the cost of half-a-day, and of preparations made as if for a battle. The punt-gun is unknown, and the natives, luckily, know little, in most places, of snaring water-fowl.

The aquatic reptiles and amphibia of Gujarat differ so little from those of the provinces already dealt with, that no great notice of them is necessary. Crocodiles (*C. palustris*) and freshwater turtles abound. The Crocodiles eat the turtles and the turtles eat whatever they can get. Both attain a larger size in the great rivers than in the standing waters. The fishes, too, are much the same. I have not myself procured *Barbus tor,* the typical Mahseer in this province, nor in Khandesh, which, as far as river-fish go, is a part of Gujarat, though its water-fowl are those of the Deccan.

In those places in Gujarat where I have fished, the most sporting Barbele was, I think, *Barbus sarana,* called by the natives " Darai." I have also often got the " Kafria," a handsome fish, which I take to be identical with the Konkan Masheer, and have somewhat doubtfully identified with *B. pinnauratus.*

In the same way the occurrence here of *Labeo rohita,* the true Roho or Rahu fish, is very doubtful. Its place seems to be taken by *Labeo calbasu* and two other species, which, I think, must be *L. fimbriatus* or *Leschenaultii,* and *L. ariza;* but I am not prepared to speak with certainty.

Of the sea-fishes there is little new to say, except that in this province you begin to get the Palla (*Clupea ilisha*) or Indian Shad running up the great rivers to spawn.

If, however, the fishes of Gujarat differ little from those of our southern waters in kind, they greatly exceed them in number. A great many tanks are protected by those communities (very powerful in Gujarat) which object to the destruction of life, and the weedy deeps of the lake form natural sanctuaries. During the rains the flat and flooded country affords ample water-way to fry, and the open waters are re-stocked from these reserves.

In consequence the number of fish is everywhere very great, and the Labeos in particular attain a very large size, often exceeding twenty pounds in weight. There is scarcely any part of the province where one cannot get a little rod fishing of some kind; and in the more rapid parts of the great rivers it is sometimes really good.

Of freshwater crustacea the prawn is apparently identical with that of the Deccan and Konkan, but crabs are much less common here than in those provinces; I do not know why.

To make up for this to the birds and fishes, some of the freshwater molluscs (gasteropods) occur in vast numbers in particular tanks and marshes, especially in the North-Western plains. The Unionidæ, however, are not abundant, apparently sticking chiefly to running water and open gravelly or sandy bottoms. Now few of the tanks have sandy bottoms, unless occasionally in some one corner end of the lakes ; I think that the Nal of Viramgaum is the only one that is not marshy or weedy all round. Accordingly, I have found dead shells of a small Unio on its beach. In the eastern streams there seem to be the same two species as in the former provinces, but they do not abound.

During the hot weather the water of some tanks and lakes is affected, by some cause unknown to me (probably the liberation of gases from the mud), in such a manner that all kinds of fish rise and float gasping on the surface, and eventually die in great numbers. I have described this phenomenon, as witnessed by me on the Little Bokh (a lake of the Ahmedabad district), for the Report on the London Fisheries Exhibition. The fish that die are left to carrion fowls ; but those only moribund are captured in great numbers, and eaten without any ill result. I have repeatedly eaten them myself, and found them in excellent condition. The cause of death appears to be asphyxia, and not specific poisoning. I have mislaid my notes, but to the best of my memory the Ophiocephali are not affected; neither is any aquatic reptile or insect. The prawns do not frequent the tanks, and I do not think that the " hot water," as the natives call it, is ever observed on any river. It is well known that many bottom fish can be much inconvenienced by the mere stirring up of the mud, as by the passage of cattle or elephants through a muddy stream or tank, but I have not been able to connect the phenomenon now described with anything of that sort. It generally lasts for several days, but may be confined to a small part of a tank without visible reason for the restriction.

The freshwater of Kattywar are not materially different from those of Gujarat, except that there are no large rivers, few small ones, and by no means so many tanks as on the mainland. The chain of lakes and marshes of which the Nal of Viramgaum is the chief, lying on and often forming the boundary on the isthmus, belongs as much to the peninsula as to Gujarat proper; the chief difference between these provinces is geological, and outside of our present subject.

The next peninsula (one might almost say island), the principality of Cutch, belongs in most way to the region of the plain of the Indus; and must be considered with it. But its internal freshwaters are unimportant. The characteristic hydrographical feature of this part of the country is what we call the Ran, a great hollow separating Cutch from the mainland, which becomes at times a shallow and brackish sea. Whether it has any peculiar fishes we do not know. It might fairly be expected to have some crustaceans of its own, but I have not heard of any, and have no personal acquaintance with that part of it lying north and east of Cutch. The branch called the Little Ran, extending north of Kattywar to the British frontier at Patri and Kharaghora, does not appear to have any fishes, except such as come into it from the surrounding country in flood-time, all freshwater forms.

It may, however, fairly be hoped that the aquatic fauna of these interesting peninsulas will hereafter be fully described by some member better acquainted with them than I am.

MARATHI NAMES OF PLANTS.

WITH A GLOSSARY.

By Brigade-Surgeon W. Dymock.

(*Continued from page* 198.)

Ficus retusa, *Linn.*	नंद्रूक Nandrák.
,, sp.	लूंगर Lùngar.
,, volubile *Dalz*	दातीर Dátir.
Flacourti Cataphracta, *Roxb.*	जंगम Jangam, तांबट Támbat.
,, inermis, *Roxb*	तांबट Támbat.
,, montana, *Grah*	अटक Atak.
,, Ramontchi, *L'Herit*	काकई Káki, भेंकल Bhékal.
,, sepiaria, *Roxb*	अत्रून Atrún.
Flemingia Grahamiana, *W. & A.*	दौदौला Daudaulá.
,, sp	गरंगेरी Garangéri.

Flemingia strobilifera	बोंडर Bondar.
Fleurya interrupta	*See* Urtica interrupta.
Flueggea leucopyrus	*See* Securinega Leucopyrus.
,, virosa	*See* Securinega obovata.
Fœniculum vulgare, *Gärtn.*	बडीशोप Barishoph, वरयाळी Varyáli.
Fraxinus Ornus, *Linn.*(Manna)	शीरखिस्त Shirkhist (*impd.*).
Fumaria officinalis, *Linn.*	शातरा Sháhterah (*impd.*).
,, parivflora, *Lam.*	पित्तपापडा Pittapapara.
Garcinia indica, *Chois*	रतांबी or रतांबीर, Ratámbi or Ratámbir, भिरंड Bhirand.
,, ,, (pickled fruit).	कोकम Kokam अमसूल Amsul.
,, ,, (raw fruit)	रतांबा Ratámba.
,, Morella, *Desrouss.*	मावरुख Mávarúkh.
,, ,, (Gamboge)	रेवंचीनी शिरा Revanchini Shirá (*impd.*).
,, ovalifolia, *Hook. f.*	तवीर Tavir, हळदी Haldi.
,, xanthochymus, *Hook. J.*	ओंठ or ओंष्ठ, Aont or Aonsht.
Gardenia florida, *Roxb*	अनंदराव Anandrao, अनंत Ananta.
,, gummifera, *Linn. f.*	डिकेमाली Dikémáli.
,, latifolia, *Ait*	पांड्रू Pándrú. पापुर Pápùr, घोगरी Ghogari.
,, lucida, *Roxb*	डिकेमाली Dikémáli.
,, turgida, *Roxb*	कुरफेंद्रा Kùrphendrá.
Garuga pinnata, *Roxb.*	कांकड Kankar, कुडक Kúdak.
Géissapsis cristata	बरकी Barki.
,, tenella	लहानबरकी Lahan barki.
Gelidium sp. var.	चिनई घास Chini ghás.
Gentiana lutea, *Linn.*	जिंतीआना Gintiáná.
,, sp.	गुलेघाफीस् Gulegháfis. (*impd.*).
Gerardina heterophylla, *Dalz.*	मोठी खाजोती Moti khájoti.
Getonia floribunda	*See* Calycopteris floribunda.
Glinus lotoides	*See* Mollugo hirta.
Glochidion lanceolarium	*See* Phyllanthus lanceolarius.
Gloriosa superba, *Linn*	कळलावी Kalalávi, खड्यानाग Kharyánág, इंदय Indaye, वाघचबका Vághchabká.
Glossocardia Bosvallea.	फत्तरसुवा Phattarsúvá. G. linearifolia, *Cass.*
Glycosmis pentaphylla, *Corr.*	किरमिर Kirmir, रतकूर Ratkúr.
Glycycarpus racemosus.	*See* Nothopegia Colebrookiana.
Glycyrrhiza glabra, *Linn.*	जेष्टीमध Jeshtimadh.
Gmelina arborea, *Roxb.*	शिवण Shivan, गुमुड Gúmúd.
Gnetum scandens, *Roxb.*	कूंबळ Kúmbal, उंबळी Umbali.

Gomphrena globosa, *Roxb*	जाफरी गुंदी Jáferi gùndi.
Gossypium Stocksii, *Mast.*	रानकापूसी Rán-kápùsi *Wild.*).
,, ,, var. arboreum	हीरगुंदी कापूसी Hirgúndi kápúsi, पळहें or पलें Palhé or Palé.
,, ,, var herbaceum, *Linn.*	कापूसी Kápùsi.
,, ,, var. religiosum.	देवकापूसी Dev kápusi, एकशेंग कापूसी Eksheng kàpúsi. Yields Nankeen cotton.
Grangea madraspatana, *Poir.*	मशीपत्री Mashipatri.
Grewia asiatica, *Linn*	फळशी Phalshi.
,, Microcos, *Linn.*	शीरळ Shiral, हंसोळी Hansoli.
,, pilosa, *Lam.*	खटखटी Khat-khati.
,, polygama, *Roxb*	गौळी Gauli.
,, populifolia, *Vahl.*	गांगो Gángo.
,, salvifolia, *Heyne*	बिहल Bihal.
,, tiliæfolia, *Vahl.*	धामण Dháman, करकनी Karkani.
Grislea tomentosa	*See* Woodfordia floribunda.
Guarea binectarifera	*See* Dysoxylum binectariferum.
Guatteria longifolia	*See* Polyalthia longifolia.
,, cerasoides	*See* Polyalthia cerasoides.
Guilandina Bonduc	*See* Cæsalpinia Bonduc.
Guizotia oleifera	रामतीळ Rámtil, कारलीतीळ Kárlitil. G. abyssinica, *Cass.*
Gymnema sylvestre, *R. Br.*	कावळी Kávli, वाखंडी Vákhandi, काळी करदोडी Káli-kardori.
,, nepaulensis	*See* Anodendron paniculatum.
Gymnosporia emarginata, *Roth.*	इंगळी Ingli, इकडी Ikarí, एंकोळ Enkol.
,, montana	मालकांगोणी Málkangoni.
,, Rothiana, *W. & A.*	इंगळी Ingli, इकडी Ikarí.
Gynandropsis pentaphylla, *DC.*	तिळवण Tilvan, तीलपर्णी Tilparni, माब्ली Mábli.
Gynura nitida	दाहन Dáhan.
Gynocardia odorata, *R. Br.*	चालमोग्रा Chálmográ, चावलमुंग्री Chávalmungri.
Habenaria sp. var	ह्मेनस Mhenas.
Hagenia abyssinica, *Willd.*	कुस्सो Kússo.
Hamiltonia mysorensis	गीदस Gidasa. H. suaveolens, *Roxb.*
Haplanthus verticillaris, *Nees.*	झांकरा Jhánkara, काळा आकडा Kálá-ákará, काळा किराईत Kala Kirait.

Hardwickia binata, *Roxb.*	न्हइअंजन Nhaianjan, पारसीद Pársid.
Hebradendron Gambogioides.	*See* Garcinia Morella.
Hedychium coronarium, *Linn.*	सोनटक्का Sontakká.
,, flavum, *Roxb.*	सोनटक्का Sontakká.
,, scaposum, *Nimmo*	कोलार Kolár.
,, spicatum, *Ham.*	कापूरकाचरी Kápúrkáchari (*sliced rhizome*) (*impd.*).
Hedyotis auricularia, *Linn.*	गैमरील Gaimaril.
,, dichotoma	*See* Oldenlandia dichotoma.
,, Heynii	*See* Oldenlandia Heynii.
Helianthus annuus, *Linn*	सूर्याक्रांत Súryákánt, सूर्याकमल Súryákamal.
Helicteres Isora, *Linn.*	केवन Kevan, वरकाटी Varkáti, धामणी Dhámani.
,, ,, (fruit)	मुरुडशेंग Múrúrsheng.
Heliotropium Eichwaldi *Steud.*	पोपटबूटी Popat-búti.
,, indicum, *Linn*	सूर्याकमल Súryákamal.
,, supinum	वडासूरी Varásúri.
Helmia bulbifera	*See* Dioscorea bulbifera.
Hemidesmus indicus, *R. Br.*	उपरसाळ or उपलसारी Uparsál or Upalsári, सारीवा Sáriva, अनंतमूळ, Anantamúl.
Hemigyrosa canescens *Thwaites.*	कर्प Karpa.
Heracleum Pinda, *Dalz.*	पिंडा Pindá.
Heritiera littoralis, *Dryand*	सुंद्री Súndri.
Herpestis Monniera, *H. B. & Kth.*	बांब Bámb, नीरब्राह्मी Nirbrahmi.
Heterophragma chelonoides	*See* Stereospermum chelonoides.
,, Roxburghii, *D. C.*	वरस Varas, पांलग Pánlag.
,, suaveolens	*See* Stereospermum suaveolens.
Heynea trijuga, *Roxb.*	तीसूळ Tisúl, लिंबारा Limbárá.
Hibiscus Abelmoschus, *Linn.*	कस्तुरी भेंडा Kastùri-bhendá.
,, cannabinus, *Linn.*	अंबाडा Ambárá.
,, esculentus	भेंडा Bhendá. H. cancellatus, *Roxb.*, var. esculentus, *Linn.*
,, rosa-sinensis	जासवंद Jásavand. H. floccosus, *Mast.*, var. rosa-sinensis, *Linn.*
,, Subdariffa, *Linn.*	लाल अंबाडा Lál ambárá; पटवा Patvá.
,, tetraphyllus, *Roxb.*	रान भेंडा Rán-bhendá.
,, tiliaceus, *Linn.*	बेलपटा Belpatá.
Hippion orientale	*See* Enicostema littorale.
Hippocratea Grahami, *Wight.*	येवती Yevati.

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Hippocratea indica, *Willd.*	कझूरती Kajhúrati, तरोली Taroli.
,, obtusifolia, *Roxb.*	डवशीर Daoshir.
Hiptage Madablota, *Gärtn.*	माधवेल Mádhvel, बोखारी Bokhári, हळदवेल Haladvel, अतिमुक्ता Atimúktá.
Holarrhena antidysenterica, *Wall.*	कुडा or पांढरा कुडा, Kurá or Pándhrá Kúrá.
,, ,, (seeds).	कडु इंद्रजव Karú indrajav.
Holcus cernuus	*See* Sorghum vulgare, var.
,, saccharatus	*See* Sorghum saccharatum.
,, Sorghum	*See* Sorghum vulgare.
,, spicatus	*See* Pennisetum typhoideum.
Holigarna longifolia	हुलगिरी Húlgiri. H. Arnotteana, *H. f.*
Holostemma Rheedii, *Spr.*	तुळतुळी Túltúli, दुदुरली Dúdúrli, शिदोडी Shidori.
Hordeum vulgare, *Linn*	जव Jav, यव Yave.
Hoya viridiflora	*See* Dregea volubilis.
,, Wightii, *Hook. f.*	दुधवेल Dúdhvel, अंबरी Ambri.
Hydnocarpus inebrians	कडूकवठ Karúkavath. H. Wightiana, *Bl.*
Hydrocotyle asiatica, *Linn.*	ब्राह्मी Bráhmi. कारिंगा Káringá, कारिवणा or ना Kárivaná.
Hygrophylla spinosa, *T. Anders.*	कोराटा Koráta, कलसंदा Kalsanda, तालिमखाना Talimkhâna, तालमखाना Talmakhára.
,, Serpyllum, *T. Anders.*	रानतेवान Rán-teván.
Hymenodictyon excelsum, *Wall.*	काळा कडवा Kálá-karvà, भोरसाल Bhorsál, दंडेल or दंडेली Dandél or Dandéli.
,, obovatum. *Wall.*	सीरिद Sirid.
Hyoscyamus seeds	खोरासानी अजवान Khorásani ajván खोरासानी ओंवा Khorásáni onvá (*impd.*).
Hypoxis brevifolia	मुसळी Músli, काळी मुसळी Káli-músli, कचुरी Kachúri.
,, malabarica	
,, orchioides, *Gärtn.*	
Hyssopus sp.	झुफाई याबिस Zúfai-yábis,, (*impd.*).
Ichnocarpus frutescens, *Br.*	कृष्णशारिवा Krishnásárivá, कांटेभोंवरी Kántebhouri.
Ignatia amara	*See* Strychnos Ignatii.
Illicium anisatum (fruit)	बादिआनेखताई Bádiánékhatai (*impd.*)
Impatiens acaulis, *Arn.*	लहानतेरडा Lahántéra
,, balsamina, *Linn.*	तेरडा Téradá.

Impatiens oppositifolia, *Linn.*	संमुखपत्री Sanmúkh-patri.
Indigofera cordifolia, *Heyne*	बेचका Bechakà.
,, enneaphylla, *Linn.*	भुईगुळी Bhuigúli.
,, glandulosa, *Willd.*	गवाचामलमंडी Gaváchá malmandi, बरबेड Barbed.
,, linifolia, *Retz*	जवारीचामलमंडी Javárichámalmandi, पांढराफळ Pandharáphal.
,, pulchella, *Roxb.*	चिमणटी Chimnatti, नेरडा Nérdá.
,, tinctoria, *Linn.*	भुई तरवड Bhui tarvar.
,, ,, (indigo.)	नीळ Nil, गुळी Gúli.
,, trifoliata, *Linn.*	वेकारिया Vekáriya.
Inga dulcis	*See* Pithecolobium dulce.
,, xylocarpa	*See* Xylia dolabriformis.
Ionidium suffruticosum, *Ging.*	रतनपरस Ratanparas.
Ipomœa Batatas, *Lam*	रताळू Rátálu, कांगी or कोंगी Kángi or Kongi, रतनवेल Ratanvel.
,, Bona-nox, *Linn.*	चंद्रकांत Chandrakant, गुलचांदणी, Gulchándani.
,, campanulata, *Don.*	गवळी Gavali.
,, coccinea, *Linn.*	इषकपेच Ishkpecha.
,, cærulea	नीलपुष्पी Nilapushi. I. hederacea, *Jacq.*
,, ,, (seeds.)	काळा दाणा Kálá dáná.
,, digitata, *Linn.*	भुईकोहोळा Bhuikoholá, विदारीकंद Vidárikand.
,, ,, (young tubers).	असगंद Asgand.
,, muricata, *Jacq*	भौरी Bhauri.
,, ,, (seeds)	काळा दाणा Kálá dáná.
,, pescapræ	मर्यादवेल Maryádvel, मर्जादवेल Marjádvel. I, biloba, *Forsk.*
,, Quamoclit, *Linn*	गणेशवेल Ganeshvel, सिताचे केस Sita che kés.
,, reniformis, *Chois*	उंदिरकानी Undirkáni, आखुकर्णी Ákhúkarni.
,, reptans	नाळीची भाजी Nalichi bhaji, पानवेल Pánvela I. aquatica, *Forsk.*
,, sepiaria, *Kœn.*	आमटी Ámti.
,, turpethum, *Br.*	निशोत्तर Nishottar, तेंड Ter, शेतवड Shetvar, शेताड Shetár, फूटकरी Phútkari.
,, vitifolia, *Sw.*	नावलीचावल or नाउळी Návalichável or Naúli.
Iris germanica, *Linn.* (root)	बाखेबनफ्शा Bikhébanafshá (*impd.*)
,, Pseudacorus, *Linn.* (rhizome.	पाषाणभेद Páshánbhéd (*impd.*)
Isachne elegans, *Dalz.*	दूंड Dúnd.
Ischæmum pilosum, *Wight*	नथ Nath, कुंड Kúnd.

Ixora coccinea, *Linn*	बकोरा Bakorá, पेंटगूळ or पेंडगुळ Pentgúl or Pendgúl.
,, nigricans, *Br.*	कचकूरा Katkúrá.
,, parviflora, *Vahl.*	कूरत Kúrat, राईकूरा Raikúrá, माकडीचें झाड Mákrichejhar.
Jambosa vulgaris	*See* Eugenia Jambos.
Jasminum angustifolium, *Roxb*	रेवती Revati, रानमोगरा Ránmográ,
,, arborescens, *Roxb.*	कुंद or कुंदी Kúnd or Kúndi.
,, aureum, *Don.*	पिवळी जुई Pivalijui, सोनजुई Sonjúi.
,, auriculatum, *Roxb.*	जाई Ja जुई Jni.
,, elongatum	नेवाळी Nevali, J. Roxburghianum, *Wall.*
,, grandiflorum, *Linn.*	चमेली Chameli.
,, latifolium	कूसर Kusar, J. arborescens, *Roxb.* var. latifolia.
,, officinale, *Linn*	सायली Sáyli.
,, pubescens, *Willd.*	विखमोगरा Vikmogra.
,, Sambac, *Aiton*	मोगरा Mográ.
,, ,, (double var.)	बटमोगरा Batmográ.
Jateorrhiza palmata, *Miers.* (*root*).	कलुमकाचरी Kalúmkáchari (*impd.*)
Jatropha Curcas, *Linn.*	मोघलीएरंडी Moghli erandi, जईपाल Jaipál.
,, glandulifera, *Roxb.*	जंगलीएरंडी Jangli erandi, अंदरबीबी Under bibi.
,, Manihot, *Willd.*	सांवरचायनें Savarcháyén.
,, multifida, *Linn*	चिनई एरंडी Chini-erandi.
,, nana, *Dalz*	कीर्कुंडी Kírkúndi.
Johnia congesta	*See* Dolichos biflorus.
Jonesia Asoka	*See* Saraca indica.
Juglans regia, *Linn.* (fruit)	अक्रोट Akrot (*impd.*)
Juniperus communis, *Linn.* (fruit)	अब्हल Abhal, हबेलअर्हर Habelarhar (*impd.*)
Jussiœa villosa	पानलवंग Panalavenga. J. suffruticosa *Linn.*
Justicia Adhatoda	*See* Adhotadda vasica.
,, Ecbolium	*See* Ecbolium Linneanum.
,, echioides	*See* Andrographis echioides.
,, Gendarussa, *Linn, f.*	तिव Teo, बाकस Bákas.
,, infundibuliformis, *Willd.*	आबोली Áboli, vulg. अबोली Aboli,
,, paniculata	*See* Andrographis paniculata.
,, picta, *Roxb.*	करड अडुळसा Karad-adulsá.

Justicia picta var., nigrícans.	काळा अडुळसा Kálá-adulsá.
,, procumbens, *Nees.*	घाटीपित्तपापडा Gháti pitpápara.
,, trinervia	सूत Sut.
,, verticillata	*See* Haplanthus verticillaris.
Kalanchoe laciniata, *D. C.*	पर्णबीज Parnabij.
,, pinnata	*See* Bryophyllum calycinum.
Kæmpfæria galanga, *Linn.*	चंडमूला Chandamulá, चंडहासा Chandhasá
,, rotunda, *Linn.*	भुईचाफा Bhui cháphá, भुईचांपा Bhui-champá.
Kydia calycina, *Roxb.*	वारंग Varang, वारगड Varangar, भोटी Bhoti, पोटारी Potári.
Kyllingiamonocephala, *Linn.*	निर्विषी Nirvishi.
Lablab vulgaris	*See* Dolichos Lablab.
Lactuca Heyneana	सादीमांदी Sádimándi.
„ remotiflora, *D.C.*	उंदीरकानी Undirkáni.
„ scariola, *Linn.* var. sativa	काहू Kahu.
Lagenandra toxicaria, *Dalz.*	वत्सनाभ Vatsanabha.
Lagenaria vulgaris, *Seringe.*	कडूभोपळा Karubhopla, कटू तुंबी Katutumbi, अलाबू Alábu.
Lagerstræmia indica, *W.&.A.*	चिनई मेंदी Chini-mendi.
,, lanceolata, *Bedd.*	बोंडर Bondar, कुंबया Kumbiyá, बोंडगी Bondagi, सुकुट्या Sukutyá.
,, parviflora, *Hook.*	लहानबोंडर Lahán bondar, &c., &c.
,, reginæ *Retz.*	तमण Taman.
Lagera aurita, *Scuhltz-Bip.*	जंगली मुळी Jangli-muli.
Lallemantia Royleana, *Bth.* (seed.)	तुक्मेबालंग Tukmebálang (*impd.*).
Lamprachænium microcephalum.	ब्रह्मदंडी Brahmadandi.
Lantana indica, *Roxb.*	घाणेरी Gháneri. The foreign species bear the same name.
Lasiosiphon speciosus, *Dcne.*	रामेठा Rámethá.
Lathyrus sativus, *Linn.*	लांग Láng.
Laurus glaucescens	*See* Machilus glaucescens.
Launæa pinnatifida, *Cass.*	अलमिरो Almiro, पाथ्री Páthri.
Lavandula Burmanni, *Benth.*	गोरेआ Gorea, आस्मानी Asmáni.
„ Stæchas, *Linn.*	ऊस्तखुदूस Ustakhudus (*impd.*).
Lawsonia alba, *Lam.*	मेंदी Mendi.

Lebedieropsis orbicularis, *Müll-Arg.*	गरारी Garári.
Ledebouria hyacinthoides	*See* Scilla hyacinthoides.
Leea crispa, *Willd.*	रायदिंडा Raidindá.
,, hirta, *Roxb*	काकजंघा Kákjanghá.
,, macrophylla, *Roxb*	दिंडा Dindá.
,, staphylea	अलथें Althé, करकनी Karkani. Leea sambuciná, *Willd.*
Leersia aristata, *Roxb.*	चौरन Chauran.
Leonotis nepetæfolia, *Br.*	मातीसूल Mátisul, दिपमाळ Dipmal.
Lepidigathis cristata, *Willd.*	भुईतेरडा Bhuiterada, कोल्हेचे चुतड Kolbeché-chutar.
,, grandiflora	*See* Calacanthus Dalzelliána.
,, prostrata, *Dalz.*	बकरा Bakrá.
Lepidium Iberis, *Linn.* (seeds),	तोद्री Todri (*impd.*).
,, sativum, *Linn.*	असालिया Asáliyá, अहळीव Ahaliv.
Leptadenia Jacquemontiana	किप Kip. L. Spartium, *Wight.*
,, reticulata, *W. & A.*	रायदोडी Raidori, शिंगुटी Shinguti, खारखोडी Kharkhori
Lettsomia elliptica, *Wight*	बोंडवेल Bondvel, केदारी Kedári.
Leucas aspera, *Spr.*	थरडुरीभाजी Thurduribháji.
,, cephalotes, *Spr.*	तुंबा Tumba.
,, longifolia, *Benth.*	गोमा Gomá.
,, stelligera, *Wall*	बूरुंबी Burumbi, गोमा Gomá.
Limnanthemum cristatum, *Griseb.*	खतारा Khatárá, कुमुद Kumud.
Lindendergia urticæfolia, *Lehm*	ढोल Dhol, गझदर Gazdar.
Linum mysorense, *Heyne*	उंद्री Undri, बांबुर्टी Bámburti.
,, trigynum	*See* Reinwardtia trigyna.
,, usitatissimum, *Linn.*	अळशी Alashi, जवस Javas.
Lippia nodiflora, *Rich*	रतोलिया Ratoliyá, वक्कन Vakkan.
Liquidambar orientalis, *Miller.* (Storax)	शिलारस् Siláras (*impd.*)
Litsæa lancifolia, *Roxb*	गुलचाई Gulchai.
,, polyantha, *Juss.*	काळेंझाड Káléjhaár, पिसा or पिशाल Pisá or Pishál.
,, sebifera, *Pers*	मैदालकडी Maidálakrí.
,, tomentosa, *Herb*	चिकणा Chikná.
,, zeylanica, *C. & Fr. Nees.*	कानवेल Kánvel चिर्चिरा Chirchirá.
Lobelia nicotianæfolia, *Heyne.*	ढवळ Dhaval, देवनळ Deonal.

Lodoicea seychellarum, *Labill.*	दर्यायनारळ Daryai náral, जहरीनारळ Jahari-náral.
Lonicera Leschenaultii, *Wall.*	हडी Hadí.
Lophopetalum Wightianum, *Arn.*	बोलपाले Bolpálé.
Loranthus amplexifolius, *W.&A.*	बैनगूळी Baingúli (Grah. 671).
„ longiflorus, *Desv.*	बंदाकपुष्प Bandákpúshp.
„ sp. var., a general name for parasites	वांदा Vándá.
Luffa acutangula, *Roxb.*	घोसाळी Ghosáli, तुराई Turai, शिरोळा Shirola. गिलचीदोडकी Gilchidorki.
„ „ var. amara.	कडूदोडकी Karú dorki, कडूघोसाळी Karú ghosáli.
„ echinata, *Roxb*	देवडांगरी Deodángri, कुकुडवेल Kúkúrvel.
„ pentandra	घोसाळी Ghosáli, पारोसी Párosi. L. ægyptiaca, *Mill.*
Lupinus albus, *Linn.* (seeds).	तिरमिसू Tirmis (*impd.*)
Lycium europæum, *Linn.*	गांग्रो Gángro, चिरचिट्टा Chirchitta.
Lycoperdon pratense, *Linn*	भुईफोड Bhuiphor.
Lygodium pinnatifidum, *pr.S.*	जानवेली Jánveli, हंसराजवेल Hansrájvel.
Maba nigrescens, *Dalz*	रक्तरोहिडा or रोडा Raktarohidá or Raktarorá.
Macaranga Roxburghii	चांदवड Chándvar, चंदर Chandar, चांदाड Chándár. M. tomentosa, *Wight.*
Machilus glaucescens	गुलंब Gùlamb, कुरमा Kúrmá. M. micrantha, *Nees.*
Mæsa indica, *Wall*	अटकी or आटकी Atki or Átki.
Mallotus philippinensis, *Müll.*	कपिला Kapilá, कपिता Kapitá, कमिला Kamila. रोहिण Rohin.
Malva sylvestris, *Linn*	त्रिकाळी Trikali.
„ „ (fruit.)	खुबाझी Khúbázi (*impd.*)
Mangifera indica, *Linn.*	आंबा Amba, आम Ám.
„ „ (dried unripe fruit.)	अंबोशी Ambosi.
„ „ (dried juice of ripe fruit)	अंबपुरी Ambapúri, आंब्याचेंसाठ Ambiyá-chesáth.
„ „ (seed)	आंबाबाठ Ámbabátha.
Mappia oblonga, *Miers*	गूर Gùr, कलगूर Kalgúr.
Marsdenia tenacissima, *W.&A.*	हब् Hab.
Martynia diandra, *Gloxin*	विंचू Vinchú.

Mathiola incana, *R. Br.* (seed.)	तोद्री Todri (*impd.*)
Matricaria Chamomilla. *Linn.*	वाबूना Bábúná.
Malaleuca leucadendron, *Linn* (oil.)	कायापुटी Kayapúti (*impd.*)
Malastoma malabathricum, *Linn.*	पालोरें Páloré.
Melhania abyssinica, *A. Rich.*	ब्राह्मी Bráhri.
Melia Azadirachta, *Linn.*	निंब or लिंब Nimb or Limb, कडूनिंब Karú nimb, वाळलिंब Bállimb.
„ Azedarach, *Linn.*	बकायण Bakáyan, द्रेक Drek.
„ dubia, *Cav.*	लिंबारा or निंबारा Limbárá or Nimbara.
„ „ (fruit).	काळाखजूर Kala khajúr, कडवाखजूर Karva khajur.
Melilotus hamosa, *Link.* (pods)	अक्लिल्उल्मलिक Aklilulmalik (*impd.*)
„ parviflora, *Desf*	वनमेथिका Vanmethiká, झीर Zir.
Melochia velutina, *Bedd.*	मैथोरी Maithori.
Memecylon edule, *Roxb.*	अंजन Anjan, याल्की Yálki, कूर्प Kúrka, लोखंडी Lokhandi.
Mengia tenuifolia	*See* Amarantus tenuifolius.
Mentha arvensis, *Linn.* (sweet mint).	पुदीना Púdiná, वतलाव Vatalav.
„ incana, *Willd.* (Bombay Peppermint).	
Meriandra bengalensis, *Benth.*	शेस्ती Shesti.
Mesua ferrea, *Linn.*	नागचंपा Nágchampá.
Michelia Champaca, *Linn.*	पिवळा चाफा Pivalá chaphá.
Micromeria stellata.	कडवट Karvat.
Microrhynchus sarmentosus	*See* Launæa pinnatifida.
Milletia auriculata, *Baker*	जिहूळ Jithúl.
Millingtonia hortensis, *Linnf.*	नीमीचंबेली Nimi chambeli, आकाशनिंब Ákás nimb.
Mimosa hamata, *Willd*	अरकर Arkar.
„ pudica, *Linn.*	लाजाळू Lájálú, लाजरी Lájri.
„ rubricaulis, *Linn.*	अराई Arai.
Mimusopis Elengi, *Linn.*	बकुळी Bakúli, ओवळी Ovali.
„ hexandra, *Roxb.*	केर्णी Kerni, रांजण Ránjana रायणी Raini.
„ Kauki, *Linn.*	अडोम Adom (of Goa).
Mirabilis Jalapa, *Linn.*	गुल् अब्बास् Gúl Abbás, संध्याकाळी Sandhy káli. (*Evening flower*).
Modecca palmata, *Lam*	उंडळ Undal.
Molluga hirta, *Thunb*	कोथक Kothak.

Mollnga pentaphylla	झरस Jharas. M. stricta, *Linn.*
Momordica Balsamina, *Linn.*	करेलो जंग्रो Karélo-jangro.
,, Charantia, *Linn.*	कारली, कारवेल, कारती, कारलें, करेलो, औंबलें, Kàrli, Kárvel, Kárti, Karlé, Karélo, Omblé.
,, Cymbalaria, *Fenz.*	कडवंची Kadavanchi.
,, dioica, *Roxb.*	करंटोली Karantoli, करटोली Kartoli.
Morinda bracteata	नागकुडा Nágkúrá. M. citrifolia, var., *Linn.*
,, citrifolia, *Linn.*	आल Ála, आलें or आऊल Álé or Aula, बारतोंडी Bártondi,
,, tomentosa	असेती Aséti. M. tinctoria, *Roxb.* var.
Moringa concanensis, *Nimmo.*	रानशेवगा or शेगट Rán-shegva or Shégat.
,, pterygosperma, *Gärtn.*	शेगट or शेगवा Shégat or Shégvá.
Morus indica, *Linn.*	तूट Tút, अंबट Ambat.
Mucuna monosperma, *D. C.*	मोठी कुहिली Mothi-kúhilí.
,, pruriens, *D. C*	कुहिली Kúhili, कांटेकुयरी Kánté-kúyeri.
,, ,, (cultivated.)	गोरी कुयली Gorí-kúyeli.
Mukia scabrella, *Arn.*	चिराटी Chiráti.
Mundulea suberosa, *Benth.*	सूपी or सूप्ती Supi or Súpti.
Murraya exotica, *W. & A.*	कूंटी Kúnti.
,, Kœnigii, *Spreng.*	झिरंग Jhirang, कढीनिंब Kadhinimb, गोडीनिंब Gorinimb.
Musa ornata, *Roxb.*	कौंदीर Kaudir, रानकेळ Ránkel, कवदर Kavdar
,, sapientum, *Linn.*	केळ Kél.
,, superba, *Roxb,*	चवई or चवइण Chavi or Chavin.
Mussænda frondosa, *Linn.*	भूटकेस Bhútkés, लावसट Lavasat, शिवरडोळी Shivardoli.
Myrica sapida, *Wall.*	कायफळ Kayphal.
Myristica malabarica, *Lam.*	रानजायफळ Rán jayphal, रामफळ Rámphal.
,, ,, (seed)	कायफळ Kayphal.
,, ,, (mace)	रामपत्री Rámpatri.
,, moschata, *Willd.*	जायफळ Jayphal.
,, ,, (mace)	जायपत्री Jaypatri. (*impd.*)
,, ,, (seed)	जायफळ Jayphal (*impd.*)
Myrtus communis, *Linn.*	विलायती-मेंदी Viláyati-mendi.
,, ,, (berries)	हबउल्आस् Habul-Aas (*impd.*)
Nannorrops Ritchieana, *Wendl*	फीस् Fis.
Nardostachys Jatamansi, *D. C.* (rhizome)	जटामांसी Jatámansi, बालचर Bálchar, सुंबूल् Sūmbûl (*impd.*)

Naregamia alata, *W. & A*	कापूरभेंडी Kápúrhhendi, पित्तवेल Pittvel तीनपानी Tinpáni, Trifolio (Port.)
Narthex assafœtida	*See* Ferula Narthex.
Nauclea Cadamba	*See* Anthocephalus Cadamba.
,, cordifolia	*See* Adina cordifolia.
,, elliptica	पूग or फूज Púg or Phúj. N. missionis *Wall.*
,, parviflora	*See* Stephegyne parviflora.
,, purpurea, *Roxb*	देवफणस Deophanas.
Nelumbium speciosum, *Willd.*	कमळ Kamal, पोंशेर कमळ Poshér-kamal, पंडकांदा Pandkándá, पोंशेरें Posheré, निलोफर Nilophar, पब्बन Pabban.
,, ,, (seeds)	कमळकाकडी Kamalkákari, पबोरा Paborá.
,, ,, (scapes)	भिशी Bhishi.
Nemedra Nimmonii	*See* Amoora Lawii.
Nepeta ciliaris, *Benth.*	झूफा Zufá.
Nephelium Litchi, *Camb.*	लीची Lichi.
,, Longana, *Camb.*	उंब or ओंब, Umb, or Aomb, आषफळ Áshphal.
Nerium odorum, *Solan.*	कण्हेर Kanhér, कणेर or कणेरी, Kanér or Kanérí.
Nicandra physaloides, *Gartn*	रानपोपटी Ránpopti.
Nicotiana Tabacum, *Linn.*	तंबाखू Tambákhú.
Nigella indica	काळेंजिरें Kaléjiré, कलोंजी Kalonji. N. sativa *Sibthorp.*
Nothopegia Colebrookiana *Blume.*	अंबेरी Ambéri.
Notonia balsamica, *Dalz.*	पिरंग Pirang.
,, corymbosa	वांदररोटी Vándar roti. N. grandiflora, *D. C.*
Nyctanthes arbor-tristis, *Linn.*	पारिजातक Párijátak, हरशिंगर Harsingar.
Nymphæa Lotus, *Linn.*	उपळी-कमळ Upli-kamal, कूंनी Kuni.
Ochrocarpus longifolius, *Benth.*	गोडी-उंडी Gori úndi, पन्नाग Punnág, सुरंगी Súrangi, हरक्या Harakia.
,, ,, (buds)	तांबडे-नागकेशर Támbaré-nágkesar.
Ocimum basilicum, *Linn.*	सब्जी Subji, अजवला Ajvalá.
,, ,, var.	अजगंद Ajganda.
,, canum, *Sims*	रानतुळस Rántúlas.
,, gratissimum, *Linn.*	रामतुळस Rámtúlas, मालीतुळस Málitulas, रामदुती Rámdúti.
,, pilosum	तुखमेरिहान Túkmerihán. O. basilicum, *Linn.* var. (*impd.*)

Ocimum sanctum, *Linn.*	तुळस Túlas.
Odina Wodier, *Roxb.*	शिंटी Shimti. मोय Moy.
Olax scandens, *Roxb*	हरदुली Harduli, अराचिरी Archiri.
,, Wightiana, *Wall*	काळा गोंडा Kálágondá.
Oldenlandia corymbosa, *Linn.*	फापटी Phápati. काझुरी Kázuri, क्षेत्रपर्पटी Kshetraparpati, पारिपाट Paripát.
,, dichotoma, *Kœn.*	
,, Heynii, *Br.*	
Olea dioica, *Roxb.*	करंबु Karambu, पारजांब Parjámb.
,, ferruginea	खाव Khav. O. cuspidata, *Wall.*
Ophelia chirata	*See* Swertia chirata.
,, elegans	*See* Swertia affinis.
,, multiflora	*See* Swertia decussata.
,, pauciflora	*See* Swertia corymbosa, var. Lawii.
Ophioxylon serpentinum	*See* Rawolfia serpentina.
Oplismenus colonus	*See* Panicum colonum.
Orchis, sp. var. (tubers)	सालब्मिसरी Sálabmisri (*impd.*)
Origanum marjorana, *Linn.*	मरवा Marvá.
Oroxylum indicum, *Vent*	टेटू Tetú, टायिटू Tayitú, फलफरा Phalphára जगदळा Jagdalá.
Oryza sativa, *Linn.*	भात Bhát, डांगर Dángar, सारी Sári.
,, ,, var	अंबेमोहर Ambemohar.
,, ,, wild	देवभात Deobhát.
,, ,, (cleaned grain)	तांदूळ Tándúl.
Osmunda regalis	नदीचा मुरुड Nadicha múrúr.
Ougenia dalbergioides, *Benth.*	तनज Tanaj.
Oxalis corniculata, *Linn*	अंबुटी Ambúti, भुईसर्पटी Bhui-sarpati, नालकरडा Nálkarda, अंबोशी Ámboshi, लांडगा Lándagá.
,, sensitiva	*See* Biophytum sensitivum.
Oxystelma esculentum, *Br.*	दूधिका Dudhiká, दुधानी Dúdháni.
Pæderia fœtida, *Linn*	हरणवेल Hiranvel.
Pæonia officinalis	उदेसालब Udesálab, मामेख Mámekh. P. Emodi, *Wall.*
Panax Ginsing, *C. A. Myer*	जिनसिंग Jinsing (*impd.*)
Pancratium parvum, *Dalz.*	खिंदाळू Khindálú, भूकमळ Bhukmal, महादकांदा Mahádkánda.
Pandanus odoratissimus, *Linn.*	केवडा Kevará, केतक Kétak.
Panicum colonum, *Linn.*	रानसवा Rán savá; सावक Sávak, कुरुंद Kúrúnd.
,, coloratum	धांड Dhánd. P. crus-galli, *Linn.*

Panicum flavidum	बुर्टी Búrti, P. brizoides, *Linn.*
,, frumentaceum, *Roxb.*	कथली Kathli, शमूला Shamúlá.
,, italicum	*See* Setaria italica.
,, miliaceum, *Linn*	वरिसावा Varísává.
,, miliare, *Lamb.*	नेलाशमालू Nelashamálú, नैनिया Nainiyá.
,, pilosum	*See* Setariá glauca.
,, sp. (Dangali)	*See* Pennisetum typhoideum, var.
Papaver Rheas, *Linn.*	लाला Lálá. जंगली मुद्रिका Jangli Mudrika.
,, somniferum, *Linn.*	खसखसीचें झाड Khaskhassi che jhár.
,, ,, (capsules)	पोस्त Post.
,, ,, (opium)	अफू Aphú, अफीम Aphim.
Paracaryum cælestinum, *Benth*	निसूरडी Nisúrdi.
Paramigyna monophylla, *Wight.*	खारावागेटी or वाघंटी, Khárávágeti or vághanti कडवी-वागेटी or वाघंटी, Karvi vágeti or vághanti.
Parinarium excelsum	माटुंबा Mátumbá (of Goa).
Parkia biglandulosa, *W. & A.*	चेंडूफळ Chendúphal, गेंदू Gendú, झेंडू Jhendu.
Parkinsonia aculeata, *Linn.*	विलायती बाभूळ Viláyeti-bábhul, केसरी-बाभूळ Kesri-bábhul.
Parmelia caperata, *Ach.*	बारिक दगड फूल Barik dagar phúl.
,, kamtachadalis, *Esch.*	उस्ना Úsná.
,, perlata, *Ach.*	मोठें दगड फूल Mothe dagar phúl.

(*To be continued.*)

FURTHER NOTE ON *HESTIA MALABARICA*.

By Lionel de Nicéville, F.E.S.

On page 164 of Vol. II. of the Journal of the *Bombay Natural History Society*, Captain T. Macpherson has given a very full account of the transformations of *Hestia malabarica*, Moore. This species should, in my opinion, be sunk as a synonym of *Hestia lynceus*, Drury, the latter proving to be, the more we know of it, an eminently variable species. Mr. F. Moore has lately (Proc. Zool. Soc., Lond. 1883, p. 218), described and named three of these variable forms from the Malay Peninsula, which Mr. Distant (Rhop. Malay., p. 405), has very properly sunk as synonyms. To have been consistent, Mr. Moore should also have described the numerous varietal forms of *Hestia jasonia*, Westwood, which occur in

Ceylon, as distinct species, but as that island represents but a very small geographical area, he very wisely refrained from doing so. But the object of this Note is not so much to correct the name by which this species should be known, but to point out that Captain Macpherson is not quite correct in stating that "nothing is known regarding its early history." As far back as 1857, Mr. Moore published figures of the larva and pupa of this species (Cat. Lep. Mus. E. I. C., p. 134, n. 267, pl. IV., Figs. 11, 11*a*) under the name of *Ideopsis daos,* Boisduval. From these figures a brief description was drawn up by Major Marshall and myself in "The Butterflies of India, Burmah and Ceylon," Vol. I., p. 30. The original discoverer was a Captain Hamilton, who is said to have found them on the Tenasserim coast. This identification, however, was an error, as the following extract from Mr. Moore's paper in Proc. Zool. Soc., Lond., 1883, p. 220, n. 12, under *Hes'ia malabarica,* shows:—"The larva and pupa of *H. malabarica* were figured in the Catal. Lep. Mus. E. I. Co., pl. IV., figs. 11, 11*a*, in error for those of *G.* [= *Ideopsis*] *daos.* The figures there engraved were stated by Prof. Westwood to represent the transformation of *G. daos;* the drawings (now in the Library of the Entomological Society of London) were received by him from Capt. Hamilton; and the species in question was stated to be from the Tenasserim coast."

"In a letter which I subsequently received from Mrs. Hamilton, this lady informed me that the drawings of the above-mentioned larva and pupa were made from specimens taken on the Cotiaddy Pass, in the Western Ghauts of Southern India, not in Tenasserim, as stated by Prof. Westwood [Proc. Ent. Soc., Lond., new series Vol. I., p. 35, 1850]. This identity is also confirmed by other drawings of the metamorphoses of the same insects now in my possession."

In the last para. but four of Captain Macpherson's description there is a stupid misprint. For "suspended from its *oval* segment," read "*anal.*"

I hope, in conclusion, that the Botanical Section of the Society has ere this been able to identify the food-plant of *Hestia lynceus*; specimens of it, Captain Macpherson informs me, having been forwarded to it for that purpose. Should this be so, a note might be added to this paper giving its name, and the Natural Order to which it belongs.

LIST of BIRDS Collected by Captain F. BABINGTON PEILE in Cashmere during the Summer of 1887, and presented by him to the BOMBAY NATURAL HISTORY SOCIETY.

Jerdon's No.	Scientific Name.	English Name.	No. of Specimens.
121	Merops apiaster, *Lin.*	The European Bee-eater	3
125	Coracias garrula, *Lin.*	The European Roller	2
134 bis.	Alcedo ispida, *Lin.*	The European King-fisher	4
150	Palæornis schisticeps, *Hodgs*	The Slaty-headed Paroquet.	1
154	Picus himalayanus, *Jard*	The Himalayan Pied Woodpecker.	1
199	Cuculus canorus, *Lin*	The Cuckoo	1
254	Upupa epops, *Lin*	The European Hoopee	1
273	Pericrocotus brevirostris *Vig.*	The Short-billed Minivet	1
280	Buchanga longicaudatus, *Hay.*	The Long-tailed King-Crow.	2
288	Muscipeta paradisi, *Lin.*	The Paradise Flycatcher	9
353	Petrophila cinclorhynchus, *Vig.*	The Blue-headed Chat Thrush.	2
441	Hypsipetes psaroides, *Vig.*	The Himalayan Black Bulbul.	1
470	Oriolus kundoo, *Sykes*	The Indian Oriole	4
483	Pratincola indicus, *Bly.*	The Indian Stonechat	2
505	Rhyacornis fuliginosus, *Vig.*	The Plumbous Water-Robin	1
665	Corvus monedula, *Lin.*	The Jackdaw	1
667	Nucifraga multipunctata, *Gould*	The Many-spotted Nutcracker.	1
672	Urocissa flavirostris, *Bly.*	The Yellow-billed Blue Magpie.	2
748	Calacanthis burtoni, *Gould.*	The Crimson-browed Finch.	2
792	Turtur Pulchratus, *Hodgs.*	The Turtle Dove	1
804	Lophophorus impeyanus, *Lath.*	The Monaul	3
808	Pucrasia macrolopha, *Less.*	The Puckrass	1
901	Hydrophasianus Chirurgus, *Scop*	The Pheasant-tailed Jacana.	1
911	Porzana fusca, *Lin.*	The Ruddy Rail	1
937	Nycticorax griseus. *Lin.*	The Night Heron	1
984	Hydrochelidon hybrida, *Pull*	The Marsh Tern	1

THE POISONOUS SNAKES OF THE BOMBAY PRESIDENCY.

By H. M. Phipson, C.M.Z.S., Hon. Sec.

(*Read at the Society's Meeting on 5th September* 1887.)

A fortnight ago one of our local newspapers stated that there were not more than three, or perhaps four, poisonous snakes in the Bombay Presidency. I felt that we ought not to allow such a statement to pass unchallenged, especially as our own collection furnished evidence that nine poisonous snakes, at least, are to be found in the Presidency, and that, according to the greatest authority on the subject, Dr. Gunther, a tenth, which we have not as yet obtained, is an inhabitant of the Deccan. I consequently gave the *Times of India* a list of the poisonous snakes in our possession, all of which had been killed in this Presidencey; a list which, I think, reflects great credit on this Society, when the short time during which the collection has been got together is taken into consideration. Some of the measurements we were able to give have already attracted the notice of the press in other parts of India, and I therefore think it would be of interest to the members present, if I were to draw their attention to the specimens we possess of these particular snakes. We have, you will observe, specimens of the following poisonous snakes, all of which were killed in this Presidency :—

Colubrine.—1. *Ophiophagus elaps.* 2. *Naga tripudians.* 3. *Bungarus arcuatus.* 4. *Callophis trimaculatus.* 5. *Callophis nigrescens.*

Viperine.—6. *Daboia elegans.* 7. *Echis carinata.* 8. *Trimeresursu anamallensis.* 9. *Hypnale nepa.*

1. We will take, first, the great Colubrine snake, the *Ophiophagus elaps,* the "Hamadryad" or "King Cobra," which is probably the largest poisonous snake in the world. I say probably, as there is one in New Guinea, *lachesis mutus,* a viperine snake belonging to the Crotalidæ, which is said to reach 14 feet in length. Fortunately, the Hamadryad is not very common. Dr. Gunther, the well-known ophiologist, says that the Hamadryad is found in all parts of the Indian Continent, in the Andamans (where, I hear, it is eaten by the natives), the Philippines, Java, Sumatra and Borneo. As its name implies, it feeds principally on snakes and other reptiles. Owing to the fact of its expanding a "hood" it is frequently mistaken for a cobra, but, as you will see by comparing the specimens before you, the plates or shields on the head of the Hamadryad differ materially from those of the cobra. According to Sir Joseph Fayrer, the natives of Bengal call it the "Sunkerchor," a "breaker of shells," but he gives no explanation of this name. The snake-men about here do not appear to know the Hamadryad, but it is, undoubtedly, an inhabitant of this Presidency. We have received a skin of one from Carwar measuring 12 feet 6 inches, and another from the Goanese Ghauts which is 15 feet 5 inches in length. Major Beddome, of Madras, says he has killed one nearly 14 feet near Cuttack in Bengal, where it is common. A few years ago one was caught in the Konkan by Mr. Bulkley, who tried to take it to England alive, so we have ample proof of its occurring in this part of India.

2. *Naga tripudians*, the Cobra, is too well known to need description. It is found all over India up to 8,000 feet in the Himalayas. There are a great number of varieties, differing in colour and markings, many of which are, you will see, figured in Sir Joseph Fayrer's Thanatophidia of India. The natives, who give separate names to these varieties, maintain that they are distinct species, and that they differ considerably, not only in appearance, but in their habits. The natives are, I need hardly say, profoundly ignorant in such matters.

For instance, many of them insist that all the hooded cobras are females, and that the male has no hood and is harmless. Their "male cobra" is nothing more than the common Dhâman (*Ptyas mucosus*), the Indian Rat Snake. They also state, in support of their theory, that the Dhâman is proof against the poison of the cobra, but this has been shown over and over again not to be the case. The cobra lays from twelve to twenty eggs, once a year, during the rains, and the young show signs of their venomous power at a very early stage. Those hatched in this Society's rooms last year killed a small Malay python (*P. retuculatus*), which was placed in their cage a few days after they were born. They attacked it at once, biting it viciously across the back. The Python showed great signs of fear, but made no attempt at retaliation. It was at once removed to another cage, but died in about twelve hours. We have, as you see, many specimens of the cobra in our collection, amongst which is a young one preserved in the act of emerging from its egg. In this specimen, the fœtal tooth with which the young snake cuts its way out of the strong parchment-like egg, can be clearly seen with a magnifying glass. This fœtal tooth is shed as soon as it has served its purpose, and is, in fact, expelled the first time the snake darts out its tongue, which it usually does directly its head appears from the egg. Some of these little cobras thrived for several months on young lizards, but the others would not feed and died in about two months. They measured 7½ inches when born, and were very fat. At the end of the two months they had lost all their plumpness, but had increased their length by nearly 1½ inches. It is very extraordinary that the original nourishment obtained from the egg should be capable of sustaining them for so long a period. The cobra is an exceedingly *timid* snake, but it can be easily tamed with kindness, as you know from the living specimen in the Society's rooms. It is worthy of note that the cobra is about the only poisonous snake which those arrant impostors, the so-called "snake-charmers," ever have anything to do with. I never lose an opportunity of fraternizing with these gentlemen in the hope of obtaining specimens we are in want of, but on no occasion have I ever seen any other poisonous snake in their baskets except the cobra. The explanation of this lies, I believe, in the fact that the cobra is the only poisonous snake which can be easily and safely handled. You have only to attract its attention with one hand, while you seize it in the middle of the body with the other, and the snake is yours. It strikes in every direction, *especially at any moving object*, but it never seems to occur to it to turn and bite the hand that is holding it, as almost all other snakes would do at once. The snake-charmers have from time immemorial made great capital out of the knowledge of this simple fact. Their performances with the cobra are known to you all. The snake is taken from the basket, when a slight slap across the back brings it at once into its striking posture. *It is the constant movement of the musical instrument in front of the snake that keeps it erect, and not the noise produced.* Snakes have no external ears, and it is very doubtful whether the cobra hears the music at all. The vipers, which are far less timid, cannot be frightened in this manner, and consequently they are not used for these performances. The snake-men will tell you that the Daboia, the largest viper, or adder, of the East, is a dull snake with no ear for music, and it is interesting to note that they have evidently been repeating this nonsense ever since the time of David—*vide* Psalms LVIII.—"like the deaf adder that stoppeth her ear; which will not hearken to the voice of charmers, charming never so wisely."

The cobras in the Society's rooms feed freely on young rats, birds and toads.

3. We next come to the Krait (*Bungarus arcuatus*), which is also a very well-known snake. It is exceedingly poisonous, and is common in nearly all parts of India. We have a number of specimens in our collection from the Bombay Presidency and from Bombay itself. I have lately received two from Malabar Hill. The one contained a "brown tree snake" (Dipsas gokool), and the other a Dhâman (*Ptyas mucosus*), so that we have good evidence of its snake-eating propensities. The dark variety of the common and harmless *Lycodon aulicus* is, you will observe, very like the Krait in outward appearance, but you can readily distinguish the Krait by the large hexagonal scales down the centre of the back. The Burmese Krait (*Bungarus fasciatus*), of which we have several

beautiful specimens, is not found, I believe, in any part of this Presidency, although it occurs in parts of Bengal and Lower India.

4. Our fourth poisonous Colubrine land snake is the *Callophis trimaculatus*, which does not possess any popular name that I am aware of. It is a ground snake, and lives chiefly on other small snakes. Dr. Gunther says that the Calamariæ, which they much resemble in appearance, are their principal food. This snake, although so small, is undoubtedly poisonous. We have two specimens, one from the Konkan and the other from Bandora.

5. I have just received a telegram from Mr. G. W. Vidal, C.S., to the effect that the specimen of *Callophis nigrescens*, which he deposited some time ago with the Society, was found by him in Carwar, thus adding another poisonous snake to the list of those found in this Presidency. The upper parts of this snake are black and the lower uniform red. It grows to about four feet in length.

6. We now come to the Viperine snakes, first and foremost of which is the deadly *Daboia elegans*, the Gunus of the natives, known to Europeans in India as the Chain Viper and in Ceylon as the Tic Polonga. It is common in the Island of Bombay, and is, I believe, found in most parts of the Presidency. According to Sir Joseph Fayrer's experiments, the poison of this snake, although very different in its action, is almost, if not quite, as fatal as that of the cobra. It has, as you will observe, exceedingly long fangs and a good supply of spare ones behind ready to take the place of those in front should they be broken. From its sluggish habits, its fierceness, and the great length of its fangs, it is to be dreaded, I think, more than any other snake in this country. Most of the authorities give 50 inches as its length, but we have the head of one killed by Mr. J. C. Anderson, in Hurda, Central Provinces, which was 61½ inches. Judging from the size of the head, and the evidence of the piece of string with which the snake was measured, there is little doubt that the correct length has been stated. Like most of the vipers it is difficult to keep in confinement, but it is very tenacious of life, and has been known to live for a whole year without food. It is an exceedingly handsome snake, especially when young, as you will see from the specimens before you.

7. The only other true viper in this country is the *Echis carinata*, known here as the Phoorsa and in Sind as the Kupper. We have received it from many parts of the Presidency, and in some districts—Rutnagherry for instance—it is found in great numbers. I have

never heard of its being killed in the Island of Bombay, although the harmless "brown tree snake" (*Dipsas gokool*), which somewhat resembles it, is often sent to me as a Phoorsa. You will readily distinguish them, as the head of the Echis, like all vipers, is covered with scales, whereas that of the *Dipsas gokool* has plates or shields. Dr. Gunther was, when he issued his book on the Indian Reptiles, under the impression that the bite of this little viper was not absolutely fatal, but it has since been proved that in certain districts the mortality from the Phoorsa is very great.

8. The *Green Tree Viper* (Trimeresurus anamallensis) belongs to the family of Crotalidæ, or Pit Vipers, so called from a curious pit or cavity between the nostril and the eye, the use of which is not known. The dreaded rattle-snake of America belongs to the same family. There are eight species of Trimeresuri in India, but we have, at present, in our collection, only *T. anamallensis* from the Bombay Presidency. It appears to be common on the Ghauts, as we receive many from Khandalla, Egutpura and Mahableshwar. Dr. Gunther states that another species, *T. strigatus*, is found in the Deccan, and I hope before long some of our up-country members will be able to send us one in order that we may have specimens of the ten poisonous snakes, which are now known to belong to this Presidency.* It is just possible that an eleventh, *Peltopelor macrolepis*, may also occur in the Canarese jungles, as it is said to be common a little further south.

9. We now come to *Hynale nepa*, or the Carawala, which was found in Carwar by Mr. G. W. Vidal, C.S. Its head-quarters are in Ceylon, where it is greatly dreaded, but, like so many of the Ceylon fauna, this snake is to be found along the Malabar Coast, but probably not further north than Carwar.

I have to-day only dealt with the poisonous land snakes of this Presidency, but all the true sea-snakes are, as you know, poisonous. I may state that we have at present in our collection specimens of the following species :—

Hydrophis diadema. (Gunther.)
Hydrophis robusta. (Gunther.)
Hydrophis curta. (Gunther.)
Hydrophis aurifasciatus. (Murray.)

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* A specimen has since been received from Mr. H. S. Wise, which was killed in Carwar.

Hydrophis Phipsoni. (Murray.)
Hydrophis Guntheri. (Murray.)
Hydrophis Lindsayi. (Gray.)
Hydrophis chloris. (Daud.)
Entrydrina bengalensis. (Gray.)
Pelamis bicolor. (Daud.)

THE INDIAN HEPATICÆ.

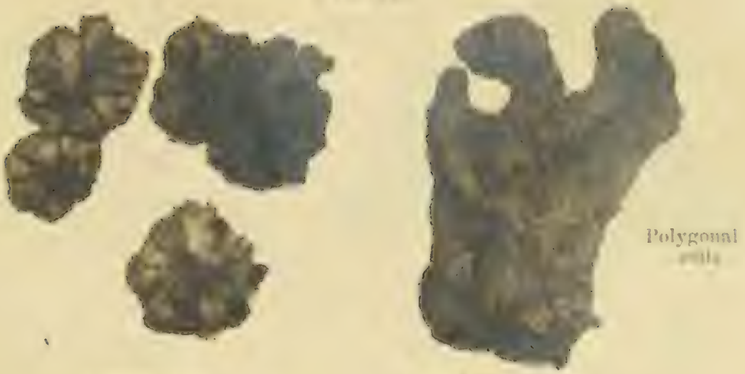
By Surgeon K. R. Kirtikar, I. M. D., Fellow Soc. Myc. (France), M. R. C. S.

(*Read at the Society's Meeting held on 5th September* 1887.)

On various former occasions I have brought to the notice of the Society that the subject of Indian Cryptogamia, or flowerless plants, has yet to be investigated; that in exhibiting before the Society, from time to time, my specimens of fungi and algæ growing in and around Bombay, I have failed to derive any assistance from works on Indian Botany; and this I repeat on the present occasion. This fact is borne out by the independent testimony of a distinguished Indian Botanist, Dr. Wellington Gray, whose observations on the Botany of the Bombay Presidency, as embodied in Vol. XXV. of the *Bombay Gazetteer*, recently published, contains the following remark:—He says, "The species belonging to the indigenous flowerless plants have never yet been fully described or investigated, and there are doubtless multitudes of new species still to be discovered. And this is literally true. Take up any book on Indian Botany,—Professor Oliver's "Indian Botany," for instance. Considering that Professor Oliver has never visited India, and that the book written is from dried Herbaria, and from species of Indian plants growing in England—in the Kew Gardens—the work is admirable. In that book containing nearly four hundred pages, however the Cryptogams are disposed of in twenty pages. No mention is made of the order Hepaticæ, specimens of which are exhibited this evening. In Gregg's text-book of Indian Botany, recently prepared for the Hooghly College in Bengal, a merely passing allusion is made to the order Hepaticæ. In Roxburgh's "Indian Flora," recently edited by Mr. Clarke, there is a chapter added on the miscellaneous Cryptogamia. No mention is made of the Hepaticæ. Now, I do not mention all this to show the magnitude of the result of my researches in that neglected branch of Botany, but rather the magnitude of the difficulties I have had in investigating the subject. I have to depend on my own resources entirely. Considering that one is accustomed to

PLATE II.

Fig. III.

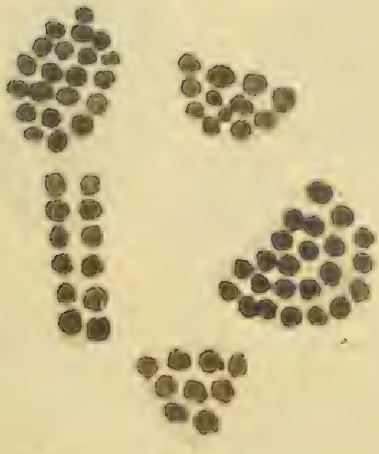


Normal size
Riccia No. 3. var. ?

One of the lobules
enlarged × 500
with chlorophyll granules.

Algæ from Vehar Water 1887.

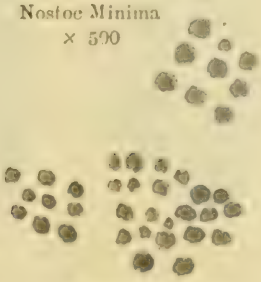
Fig. IV.



Pleurococcus Vehar.
in masses × 500

Fig. V.

Nostoc Minima
× 500



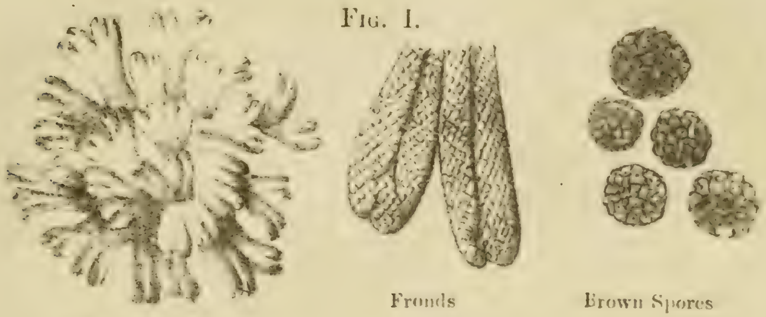
Protococcus Vehar
× 500

K. R. K. et I. B. del ad nat.

INDIAN HEPATICÆ AND VEHAR ALGÆ DESCRIBED
BY DR. KIRTIKAR.

PLATE I.

Fig. I.

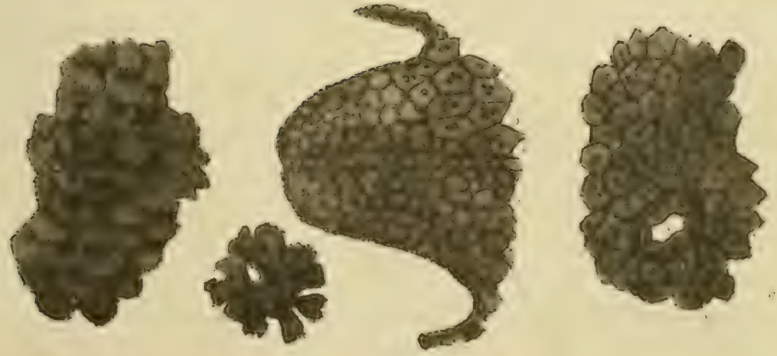


Normal size
Riccia No. 1
variety?

Fronds
magnified × 50

Brown Spores
× 500

Fig. II.



Circular frond-arrangement

Normal size
Riccia var.? No. 2.
Tile-arrangement of fronds

a. Enlarged lobule × 500
b. Stomate of Riccia No. 2.
c. Polygonal cells with chlorophyll granules.

K. R. K. et I. B. del ad nat.

INDIAN HEPATICÆ DESCRIBED BY DR. KIRTIKAR.

have information at second-hand in this country, where original facts have to be recorded, great care and caution, and accurate and repeated observations are necessary. I urge the fact of the absence of all previous information more in extenuation of the defects of my own paper than a desire to show what others have left undone. I urge this point also with a view to rouse the interest of those members of the Society who are given to Botanical pursuits, inasmuch as there appears to be an unending field for very entertaining and useful research. For the materials one has not to go very far. In the rainy season we tread these plants under our feet, the carriage wheels daily pass and repass over them near our stable door and our garden gate. They invade our eye as we stand by the garden wall, with the rich beautiful green of their foliage which the artist's pencil can never imitate. They grow on the outer side of our flower pots in isolated or close packed circlets. On dilapidated walls they are more constant, growing from year to year, drying after the monsoons. This, then, is their habitat. A moist ground or a damp spot is necessary for their growth, and they are in their prime in the monsoons. The ground may be clayey, sandy or chunam mixed. With regard to their general appearance they are leafy expansions—foliaceous. The roots of these plants are delicate and silky so entering the ground as to form a web or network, thin and friable, matted with the ground, rendering it difficult to preserve the plant or set it free from the matrix-earth in which it grows. Why the order to which the three plants belong is called hepaticæ I do not know. It is possible that from the lobed condition of the frond and its resemblance to that organ in general shape the name hepaticæ might have been given. Otherwise there is nothing in common between the liver and the liverworts. The natural order hepaticæ is allied to the mosses from which it differs in many respects, mainly in this, that in most of the liverworts there is no stem but simply a patch of green membrane spreading over the ground, whereas in the mosses there is a stem often much branched. The, hepaticæ are sub-divided into the *liverworts* or marchantiaceæ, the *scale mosses* or Junger-manniaceæ and the *Crystlworts* or Ricciaceæ. The hepatics, especially plants of the last sub-division, are often confounded with lichens, but the lichens can be easily distinguished by even a cursory microscopic examination. The plant depicted in Fig. I., Pl. No. I., is of dark green colour. The surface markings of the frond are visible distinctly under an ordinary magnifier. Under the microscope the frond presents a reticulated surface, on the upper surface of which there are open spaces representing the "stomata," or breathing spores. The frond is elongated and presents a deep groove, dark green in colour, and corresponding to the midrib of the leaf of a phanerogam. The fronds branch dichotomously, and a vertical section presents a figure of eight appearance. The cells are compressed, spherical, and give the appearance of a hexagon by mere optic illusion. There are abundant chlorophyll granules in the cells, closely packed. The roots arise from the lower surface of the mid groove. They are soft and filamentous. There are also some fine radical hairs; the fronds are succulent and not imbricated. The margins are entire. The sporangium which contains the spores is situated in the frond and is ovoid in form, containing thickly-packed brown black spores of a very definite character.

In other parts of the frond there is the commencing formation of the sporangium, where the dichotomous cell division is well marked. The full formed spores are honeycombed in appearance. No elators or spiral fibre, have been seen at all the examinations of the plant. The plant is therefore consigned to the sub-division or "Alliance," as Lindley calls it, of Ricciaceæ the diagnosis lying between this sub-division and Marchantiaceæ, in which elators exist as a matter of necessity. The plant depicted in Fig. II., Pl. No. I., is also consigned to the sub-division Ricciaceæ. The colour is brighter than that of plant Fig. I. The fronds are more delicate and less succulent. The margins are crenulate and lobed. The stomata are visible on the upper surface even to the naked eye. The roots are finer and more numerous, coming not only from midribs, but also from the under surface of the frond as a whole. The fructification of the plant has not been observed. Under the microscope the structure of the chlorophyll cells is much more delicate and oval. The stomata are strikingly sharp and hexagonal. The plant depicted on Pl. No. II., Fig. III., is peculiar in its arrangement, the tendency being to form circles by the growth of fronds all round from a central point. The colour is dark green, tinged brownish yellow. The tissue is crisp and friable, midway between that of plants figured Nos. 1 and 2. The margins are crenulate, and the greater the number of fronds packed the greater the amount of crenulation. The cells forming the substance of the frond look polygonal and compact, having large thickly set chlorophyll granules in various stages of development. This plant also belongs to the Alliance Ricciaceæ. The three plants require naming.

WILD HORSES.

By Veterinary-Surgeon J. H. Steel, A. V. D.

(*Read at the Society's Meeting on 1st August* 1887.)

In bringing forward for consideration by the Society some further questions about horses, I trust that I shall not be thought to unduly force a hobby on my hearers. I feel assured that to a large number of our members there is no lower animal more interesting than the horse, and none about which details will be more acceptable. Viewed from the high scientific standpoint no animal-being, save perhaps man himself, could be studied with more prospect of sound results and valuable generalisations. The horse is to us the best representative of hoofed animals and vegetable feeders, and to anatomists he is what Oscar Schmidt describes in the following passage:—"The best known example of this kind of an isolated form of mammal is the horse and its relatives, the genus equus. The descriptive zoologist places it by the side of the two-hoofed animals. Yet the difference between the one-toed horse and the two-toed oxen and stags remains completely unexplained. Besides this the more perfect dentition of the horse stands in sharp contrast with the reduced dentition of most of the ruminants, which lack the upper incisors; the only point of connection would seem to be the camel, which again has a much fuller dentition. Nevertheless, the horse remains a phenomenon so peculiar within itself that descriptive zoology has always classed the horse in the order of the two-hoofed animals."

This evening I want to consider *wild* horses, in some of their practical and scientific bearings, and naturally the first question which arises is, *whether there is any such creature as a wild horse?* This is rather a startling question when we consider that in at least four out of the six continents horses in a free state are found living only to a very limited degree influenced by man and most certainly not in a state of domestication. The mustang of Mexico, the wild horse of the Pampas of Southern America, the brumbie (or "Scrubby") of Australia, and the terpan of Tartary are to all intents and purposes "wild," but it is very doubtful whether, in the naturalist's sense of the term, they are truly feral. As regards the brumbie of Australia it is certain that he is the descendant of imported horses which strayed within recent years; the enormous numbers of horses of the Americas are known, from historical records, to have resulted from animals imported by the Spaniards and others from Europe. The horse of Tartary or Central Asia has no such historical record, and yet we find that naturalists of good scientific reputation almost without hesitation state that he must have resulted from domesticated animals which had strayed. Youatt says his origin has been clearly traced to horses that were employed at the siege of Azof in 1657, but it is doubtful if he refers to the true Mongolian wild horse. Certainly there are in this region large horse runs, the property of the Imperial Chinese and other Governments, and undoubtedly under not very perfect management horses stray and become lost or are enticed away by their free comrades, as is the manner of wild horses (though Youatt says, I know not on what authority, the wild horses of Tartary quickly destroy any domestic horse which comes into their power), but we have no distinct and definite evidence on this question as to whether in Central Asia the original wild stock of horse still exists in the condition of its native proprietors. We may consider the evidence fairly conclusive concerning the horses of America and of Australia, but in the case of those of Central Asia it is not proved whether the breed has descended in unbroken pedigree through ancestors which never have been tamed, or whether at some time or other in the history of his race it has yielded to the power of man. Tradition and scientific surmise (we cannot speak of it in stronger terms) point to Central Asia as the aboriginal abode of the horse, but this can by no means be proven, and it is certain that fossil horses are found in both Europe and America equal in age to those of Asia, thus tradition dating even from extremely remote periods can have litttle importance attributed to it, and it is much to be doubted whether the scientific view which has hither to been adopted will hold ground against some most recent observations in this connexion. Darwin's statement that "no aboriginal or truly wild horse is *known* to exist" must still be held as explaining the exact position of this question, but we must supplement it by stating " it is not certain that truly wild horses do not exist."

Our evidence in elucidation of this matter must, as we have seen, be brought to bear on Central Asia ; unfortunately, it cannot be accepted as conclusive, being based on the statement of travellers, which are in each case that I can find only second-hand and through an interpreter, who possibly was well aware his employer would be very glad to hear there was such a thing as a wild horse. The latest information on this subject apparently is that in Prejevalsky's Mongolia, from the English edition of which, edited by Yule, we find that Father Hyacinthe, writing of Middle Mongolia, speaks of wild camels, wild mules, wild asses and wild horses. Sir D. Forsyth, in a printed report of his last mission to Kashgar, mentions, apparently from native information, wild horses mixed with wild camels. These " horses " were probably Kulans (Turki for Kyang) "this equivoque is probably at the bottom of many mentions of wild horses ; but I would not say so positively. " (Yule.) Thus Dr. Bellew in his " Kashmir and Kashgar, " p. 400, speaks of a place called Kulan Uldi, which means "The wild horse (ass ?) died" ; and elsewhere he speaks of meeting a herd of six or seven Kulan or Kyang. Jerdon tells us that Cunningham calls the Kyang the wild horse, and states that it *neighs.* Now the Kyang or Kulan is an anima. about which there is much debate as to whether he is a horse or an ass. He his bigger than most asses, has a voice which some observers call a neigh and others a bray, his ears are much smaller than those of most asses. He is described by Prejevalsky as " in appearance closely resembling a mule." His importance to us at present is that we must distinctly understand that he is not here considered a wild horse, and all the statements of travellers who seem to have considered him as such must be excluded from our evidence. It would almost be right, if practicable, to exclude all hearsay evidence, for it seems that in Central Asia the Mongols often confuse the wild ass and the wild horse, and mention the two animals under the same name, just as in some parts of India there is only one name for sheep and goats. The only fairly exact and positive evidence I can find is that of Prejevalsky (p. 169, vol. II.), who says:—"The natives repeatedly told us of the existence of both wild camels and wild horses, and described them fully . . . Wild-Horses, called by the Mongols *dzerlikadu,* are rare in Western Tsaidam, but more numerous near Lob Nor. They are generally in large herds, very shy, and when frightened continue their flight for days, not returning to the same place for a year or two. Their colour is uniformly *bay* with black tails and long manes hanging down to the ground. They are never hunted owing to the difficulties of the chase. * * * The plains of Tsaidam are 1,700 feet below Kokondi, and on this account the climate is warmer. The absence of water aslo tends to increase the heat."

Thus we must conclude that the evidence is slightly in favour of the existence of wild horses in Central Asia, but we have no evidence as to his pedigree in relation to domestication.

The Shetland pony is practically the wild horse of the British Isles, and illustrates on a small scale the peculiarites of horses which have gone wild. He is evidently not the British horse exported by Julius Cæsar as "being powerful, and by stature and training well suited to war."

The question now arises as to *whether all horses of the present day have come from one original stock or have been developed on parallel lines.* Wild horses certainly existed in the distant past, and it behoves us to inquire in what respect they resembled and how they are related to those of the present day and also our domesticated horses. The original horse may not now exist in a wild state, but he must be lineally represented by our horses, and his comparison with them must result in important observations. The question of origin of the horses of America is soon settled. As Oscar Schmidt shows, the Palæotherium soon disappeared in South America, but became very numerous and continuously developed in North America as in Europe and Asia. Marsh considers that a true equus appeared in the upper Pliocene, and this in the post-tertiaries roamed over the whole of North and South America, but very soon became extinct. Schmidt concludes that " the true horse of our day never existed in America before its importation." The primitive equine forms of America are thus supposed to have been crushed out by the ice formations of the Diluvium. Among the forms thus lost must be included Equus andium (Branco) as found in the volcanic tufa of Ecuador, probably also the coeval diluvial pampas horse, the cave horse of Brazil, and the Equus curvidens (Owen). In Equus andium it has been observed that the eyes must have been situated much deeper than in Equus caballus, in which the orbit, has moved further back. Altogether, concludes Schmidt, the American members of the genus horse have never advanced so close to our present horse as the diluvial members of the European family did. Forsyth Mayor shows that Equus stenonis of the quaternaries of Upper Italy contains all the intermediary stages between Hipparion and Equus. Schmidt continues the argument on this important subject, on which he is not always quite clear, by drawing attention to Goethe's observations on the backward position of the eye in the horses of the Parthenon; they are far back against the ear, and, says Goethe, this was, though the artist may not have known it, the condition present in the primeval horse.* It must be remarked, however, that evidence tends to show that of the cave horses some had eyes far back and some in the position of those of the present day. These cave horses were useful to man but not domesticated; they lived in the reindeer period, and found their most deadly foe in man, who pursued and killed them for flesh food. As yet all conclusions as to their make and shape seem to be derived from the work of a Landseer of the stone period, who drew a picture of a man, horse, and a mammoth in recognizable outlines on pieces of ivory. The horse seems rather a small one and has a big head. This curious record of art in the nursery stages of the world's history must not be considered from the severely artistic point of view, but much as we would a child's production in the present day, in no way detracting from the credit of this earliest of the world's known artists.

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* Youatt's views on conformation of the Parthenon horses will be read with interest as bearing on the text :—

"There is a considerable difference in the form and action of the two horses. The right hand one, and the foremost of the two, is sadly defective in the portions of the forearms which we are permitted to see. The near one is poorly supplied with muscle. The off horse is out of all keeping. The large ears placed so low; the clumsy swelling of the lower part of the neck; the bad union of it with the breast; the length and thinness of the barrel compared with the bulk of the fore parts, notwithstanding the natural and graceful position of the hind legs, show no little want of skill in the statuary. The more animated head of the left and hinder horse, the inflated nostril, the opening of the mouth, the form and prominence of the eye, and the laying of the ears, sufficiently confirm the accounts which we have of the spirit—sometimes untameable—of the primitive horses. The neck, however, is to short, even for one with these immense forehands; it springs badly out of the chest, the shoulder is very defective; but the forearms, their expression and their position, are exceedingly good; the long forearms and short leg are excellent; and so are the off fetlock and foot; but the barrel is deficient, the carcase is lengthy, and the hind quarters are weak compared with the forearms. The beautful execution of the riders * * * shows that they were portraits, as probably the horses were to a very great extent. These animals remind us of some of the heavy ones of the present day particularly; they have the beauties and defects of many of the modern Holstein horses; they are high, but perhaps heavy actioned; courageous, sprited, possibly fierce. They exhibit the germs of many future improvemente, and, taken altogether, may be examined with considerable pleasure, remembering that they are horses of nearly 2,300 years ago. Art has done much for the horse since that period, but the countenance and figure of the human being were at that time perfect. These horsemen have not even the switch to guide the animal; but they are holding by the mane with the left hand, and are evidently directing the horse by pulling the mane, or pressing the neck with the right hand a little higher up."

It looks more as if the mane were not held at all, but guidance made by pressure with the forefinger of either hand on the corresponding side of the neck. Youatt seems slow in giving the artist credit for as much faithfulness in representation of the horses as of the men; of course, he may not have been an "animal" artist.

It seems to be generally accepted by British naturalists that the horse of the present day came from one original stock. This was the view of Cobbold. (Museum of Natural History.) Martin Duncan says : "All true horses are descended from Equus caballus, a well established species," and so on. Schmidt combats the view of the domesticated horse having a single origin from the original wild stock. He shows reason to believe that, perhaps, some of the slighter breeds of the present day have resulted from the taming of the broad-browed horses of Southern Germany, but certainly some of the tamed thin-boned horses of the bronze period were of Asiatic origin and introduced by nomads. Ecker also considers that of the two breeds of German horse described by the Roman writers (Cæsar included), the small and hardy native race was indigenous, but the Equus caballus germanicus (of Sanson and Piétrement), the heavy horse of Central Germany, was an imported animal, probably of Asiatic origin, tamed and introduced by nomadic tribes in prehistoric times.

Two groups of domesticated horses have been distinguished : (1) the Oriental, with well developed cranium, forehead broad, face small, inner side of crescents of upper molar with but few enamel folds, limb bones graceful and firm ; the Arab, for example. (2) The Occidental (Franck of Munich), face much larger as compared with cranium, long narrow skull, forehead narrow, rims of orbits somewhat forward, enamel folds of crescents of upper molars very complex, limb bones thick and massive, and of less dense structure than those of the Oriental. Nehring shows that the diluvial horse of Central Germany—found at Westenregeln near Magdeburg, at Thiede (Brunswick), also along the Rhine in the neighbourhood of Remagen—presented all the characteristic features of the Occidental horse. Fraas has described a Schussenried breed of fossil horses, found in S. W. Wurtemburg, with very broad foreheads and graceful limbs. In France, Sanson and Piétrement have arrived at some very interesting conclusions with regard to the horses in relation to the domesticated races of the present day. Piétrement shows that it is untenable that the horse of Solutré (a primeval form of the reindeer period, which abounds in caves near Macon, north of Lyons) was tamed and domesticated, but Schmidt concludes that in it we very likely have one of the races which subsequently became domesticated, and which left descendants that probably still exist, such as the long-headed Ardennes horse and the Carmague small semi-wild horses of the Rhone delta. Also in Alsace there is a race of large ponies which Schmidt thinks probably the last offshoots of a race of this kind; they have large and ugly heads, well formed bodies (although no care whatever is exercised over their breeding), and their limbs are powerful. They are good-natured, docile, and very strong in moving weights. The sum of these observations and arguments is hardly conclusive as establishing that horses were domesticated locally; yet it seems to be clearly established, however, that there were at least two well-marked varieties of the cave horse, the large-limbed, narrow-headed form and the small-limbed well-shaped, broad-skulled animal. These variations we must to a very large exent put down to local conditions; the experience of breeding domesticated animals, even during the short period of half a century, shows that the large size of the variety and narrowness of the skull depend on the amount of food obtainable within a limited range of grazing, whereas compactness of bone, smallness of face, and greater relative development of the cranium result from opposite conditions, as may be illustrated by comparison of the skull of a Lincoln sheep with that of a Southdown. The result of scientific research so far has, we may conclude, supported what we may term the commonsense conclusions with regard to horse domestication. Of the methods of capturing the horse or wild ass in the present day* almost all would not be practicable to our earliest horse-taming forefathers, for they naturally could neither adopt the corral nor lassoing system; also they had nothing on which to ride down horses. Either they captured the very young, or else they cured animals captured alive after being maimed with axes, arrows, or other primitve weapon. Certainly they got many horses for food in those days, and probably, as the Bikanir hunters are described as doing now, they caught the foals and tamed them. Doubtless, from the earliest times migration of equine animals have taken place; it is supposed that in the period of the early tertiaries such a migration occurred to America, and that there was also a very early migration from Central Asia in other directions, as to the western limits of Europe. Doubtless also early human migrations influenced the spread of the horse in such a way that even the special races of different countries have from time to time had constant admixture of foreigen blood both in the pre-historic and historic periods. Yet we cannot believe that so obvious a process as domesticating horses did not take place simultaneously in different countries and so act as an important factor in the production of local breeds. All methods of the present day are but modifications of those of the past; in this, as in other matters, "there is no new thing under the sun." I cannot conceive that given men of a number of different races with horses to hand and constantly killed as food, it would occur only to the Mongolian to endeavour to domesticate so tractable an animal! Martin Duncan shows that the domesticated horse was first known in the Swiss Lake period, and must have been driven in the bronze period, for bronze bits have been found in France and Italy. He quotes Hamilton Smith's conclusion that the first domestication of the post-diluvium horse was achieved in Central Asia, or commenced nearly simultaneously in the several regions where wild animals of the horse form existed; the latter seems the most tenable view.

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* Mehods of capture of wild horses:—

1. Corraled; thrown by means of lasso round fore legs, saddled, bestridden, and then let go and spurred until controllable.
2. Loose wild horse lassoed and jerked off legs, then ridden.
3. Ridden down by relays of horses.
4. Bewildered by falcon flapping wings in the eyes.
5. Brought down and stunned by a rifle shot behind the ear.
6. Capture and rearing of foals or of wounded horses.

With regard to *climatic and physical conditions under which wild horses live,* the Steppes of Tartary are described as great treeless plains at considerable elevation. The Kyang inhabits the Thibetan plateaux some 15,000 to 16,000 feet above the sea-level, and the Mongolian wild horse of Prejevalsky is found on the plains of Tsaidam, some 1,700 feet below the Kokonor Stepp. In Bolivia the llanos are described by Spence as a series of enormous level tracts watered by navigable rivers and covered by verdant turf, where vast numbers of mules, horses and asses pasture. These tracts are subject to floods during which the horses take refuge on table-lands, which form, as it were, islands in the flood, and the mares (with their foals) may be seen swimming about in the water browsing on the tops of the long grass projecting over the water. Wide plains of pasture, undulating and even hilly, are suitable for the wild horse, running streams and perennial grass are advantageous to him, but he at times undergoes great straits both for food and water. The arguments with regard to the nature of the land on which the fossil horses were found have been rather in a circle. It has constantly been assumed that the occurrence of remains of horses implies vegetation and climate resembling those of the Steppes or, again, that wide grassy plains imply suitability for horses. As a matter of fact, we know that horses thrive in a remarkable variety of climates and on many soils, but a tendency to dryness with heat is favourable, heat with moisture and an alluvial soil are conditions unfavourable in the extreme, and indeed often suffice to produce extermination. When one comes to think of it and to compare America and Australia with South Africa, the question naturally arises, why have not horses gone wild in the latter place, where many must have escaped, just as in Australia and America? If we may judge from the presence of the zebra, quagga, and Burchell's zebra, the climate and soil is everything that could be required for the production of a wild race in South Africa, and yet one has not appeared! It seems to me that this is the result of one of two causes or, perhaps, of a combination of each. The South African territory was originally occupied, indeed fully populated, by equines before importation of the horse, and the latter has had to contend with that terrible enemy, the Horse Sickness, not to mention animals of prey and such small but serious foes as the Tsetze fly. Youatt seems to have had a suspicion that wild horses were found at the Cape. He had probably heard the Dutchmen and other travellers talking of the Wilde Paarde, the Boer name for the zebra. He says: "At the Cape of Good Hope we find that the horse, if a native of that country, is only occasionally seen in its wild state. * * * The wild have long disappeared from the colony, and we have no authentic record that any of them were even taken and attempted to be domesticated." This was written about fifty years ago. Darwin noted some curious facts about the non-spread of horses in the Falkland Islands to the degree that might have been anticipated. Firstly, he attributes some influence to the fact that the hoofs, on account of softness of the soil, become overgrown, and so limit progression; secondly, the stallions insist on the mares accompanying them often before the recently born foal is able to move sufficiently fast. Wherever the horse runs wild, there seems to be what we may fairly consider as a *recurrence to ancestral manners*. Each stallion has his following of mares ranging from a few up to forty or even fifty, and these parties may be separate or banded together into herds of considerable size—sometimes, it is said, 400 strong. The young and weak males remain with but a scanty or even no following. The stallion has to maintain his supremacy by frequent combats, which especially occur at certain seasons of the year. Youatt mentions frequent combats between different *herds*, but the general evidence tends only to the occurrence of contests for supremacy between different stallions. The animals are suspicious in the extreme, swift of flight, but bold in defence with tooth and heel in emergency. They range extensively in search of pasture and water, and when hard pressed by danger or famine, the herds break up. It is said that each troop has a leader and implicitly obeys him, he is the first to face danger and to give the hint to fly ; when hard pressed, the horses form a ring, with the mares and foals in the centre, and defend themselves vigorously with their heels, or they close in on their opponent in a dense mass and trample him to death. A favourite proceeding of these animals seems to be the tempting of domesticated horses to join them, a source of much annoyance to breeders in Australia, as also is the invasion of their runs by wild stallions, which vitiate select breeds in a most annoying manner. Wild horses are sagacious in avoiding sportsmen, keen of scent, and vigilant. Many wild horses in America are found with saddle marks, and I have seen the skull of an unfortunate individual with each side of the lower jaw almost cut through by pressure from a halter which he wore when as a youngster he escaped from captivity.

With regard to *shape*, it is much to be regretted that from Job even unto Byron, our authors and travellers have thought advisable to view the horse in a state of nature from the poetic rather than from the practical side. We have very few "horsemen's descriptions" of these animals in so far as I can learn, and the pictures given us are either over-artistic, evidently taken from stuffed specimens or not reliable. The brumbies are described by Anthony Trollope as "perfect marvels of ugliness," and elsewhere we are told that they are small, hardy and remarkable for the excellence of their feet, but seldom worth the trouble of capture and training. The picture before us of the wild horse of Tartary looks like that of a youngster. Its most striking features are a most ugly head, with coarse Roman nose and convex forehead, short muzzle, little cranium ; head badly set on, no shoulder, deficiency of barrel, ugly quarters, round short hocks, upright pasterns, and great length below the knees and hocks. To counteract these bad points there is power in the quarters, arms, and thighs; the animal is well ribbed up and the feet look good. The picture of the mustang exhibited reminds us of a thoroughbred circus horse let loose, and is evidently a flight of imagination on the part of the artist. Youatt, in speaking of the wild horse of South America, mentions him as possessing much of the form of the Spanish horse from which he sprang, as not remarkable for speed, but wonderfully enduring, and knowing no pace between a walk and a gallop. Spence, in his "Land of Bolivar," speaks of them as "small, strong built, and capable of enduring any amount of fatigue."* Unsoundness of hoof of the wild horse is not often seen, but its general infrequence under natural influences contrasts markedly with the terrible frequency of foot lameness, in spite of all care, among domesticated horses. It teaches us the important lesson to get the natural wear and bearing as much as possible, but must not be misled, as by some, into teaching that the domesticated horse should go unshod. According to the latter argument pushed to its logical conclusion, our horses should be fed only on grass and never be groomed!

The original colour of the horse has been a subject of much debate, and seems to have been pretty generally accepted that the primitive horse was *dun.* Martin Duncan says the evidence on this point dates back as far as the time of Alexander the Great: that the wild horses of Western Asia and of Eastern Europe are *dun,* and that the *duns* much predominate among some unmixed breeds, such as those of Hungary and Norway.† It will be seen that the arguments of the learned professor are weak in the extreme. Whether or not the historians of Alexander the Great *saw* wild horses I can't say, but I consider it extremely probable that they saw only wild asses of Persia, Assyria, Scinde and even, possibly, the Kyang in the Punjab. Again, I doubt very much whether colours were recorded with as great discrimination by those historians as even by our travellers of to-day, and it is probable that the names of the colours of their so called wild horses were first confused by the language of the natives of the country in which such animals were found; secondly, rather mixed up in the Greek; thirdly again confused in translation into English, either directly or through the Latin. It is certain, that mere descriptions of colour are rather limited in value even when there are no obscurities of language. Darwin noticed that roan and iron-grey predominated among the wild horses of the Falkland Islands as descended from horses left by the French in 1764. Youatt says of the Tartary horse that he is "generally of a red colour with a black stripe along the back." Martin Duncan considers him mouse-coloured, and agrees as to the dorsal stripe, and he speaks of these horses as the "nearest example of the stock from which the domesticated horse was derived." Prejevalsky mentions the wild horse of Central Asia as bay, and elsewhere we hear him described as of a "rufous tinge." Any one who has had to describe properly a number of battery or transport mules, or even of country-bred horses, will clearly enter into the colour difficulty, and understand how naturalists for scientific exactness would need some such standard colour scales as those introduced by Broca for anthropological observers. He will also have observed how wide embracing and indefinite are the vernacular colours *kumait* and *lal!* In India we have in the Kattywar horse, which comes from a locality, the geographical position of which secures to an extent purity of race, an example in favour of *dun* being the original colour, and among country-bred stock we find many *duns* and mouse-coloured horses. We observe a great tendency of prevalence of the donkey mark along the back, and even slightly a cross mark on the shoulders, also pale colour of limbs and markings on the knees and hocks, zebra-marks. The frequency of parti-colouration is simply the effect of natural crossing; it is seen among all semi-wild stock and low-caste varieties of the horse. As regards colour of original horses, I think we can come no nearer a conclusion than that the groundwork varied somewhat in the different localities according to prevalent colour of soil, probably from very light *dun* through mouse-colour and chestnut to bay-brown, there being a well-marked donkey stripe and small cross bands, occasionally also faint stripes about the knees and hocks of a darker colour; the limbs, lower part of the belly and muzzle generally somewhat lighter than the rest of the body. All the darker colours, all parti-colouration, and marks have probably resulted from domestication. A few of the original breed also probably were Albinoes.

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* There was nearly half a century between when Youatt and Spence wrote; the stamp of the South American horse may materially have altered in that time.

† I am indebted to Mr. F. Stockinger, Consul-General for Austro-Hungary in Bombay, for the following interesting information on Hungarian horses, as conveyed to me in a letter received since the paper on "Wild Horses" was read:—"The Hungarian is certainly one of the best mixed breeds on the surface of the earth, as the Government and private persons have for more than a century imported Arabs, English, Spanish, Norman, and other blood for breeding purposes; in fact, half to three-fourth of the blood in the Hungarian horse is foreign. A commission of landowners and officers visits periodically every part of the country and selects the stallions best suited for the place. The thoroughly Hungarian city of Debreezin owns a stud in which they pride themselves to have preserved the original Hungarian horse in its primitive state unmixed with other blood. I have visited that stud * * and found that the horses are, without exception, bays or brown."

With regard to *shape*, all the evidence tends to the belief that in all the points which render a horse useful to mankind, domestication has improved him, though he probably has been rendered less enduring and more liable to disease. The cave horse, whose portrait has been handed down to us carved on horn, had a large head, thick neck, big mane, and coarse and clumsy points (Duncan); but we have seen that the artist cannot be absolutely relied on for proportions.* If we be permitted to imagine, on the basis of what we know of the oldest wild horses and of the least cared-for breeds, we may describe the original horse as follows :—Head large, fine or coarse in the muzzle, badly put on, eyes far back, ears large, neck thick and coarse, shoulder small and upright, forearm muscular and short, tendons a little deficient below the knee, pasterns upright, feet blocky and good, back rather short, girth moderate, loins muscular, quarters round, tail set on low, hocks big and compact but very short, thighs very short but muscular.

Now, such a horse is not at all what we would try to buy for any domestic purpose, but it is the unspecialised form which in the zebra and wild ass we find compatible with fair speed, remarkable endurance, and other high qualities. I, as a horseman, criticising the works of Nature, must not be supposed to be indulging in ridiculous fault-finding with perfection. The wild horse is suited admirably to the wild free life for which he is intended, but he cannot compete either in speed with the race-horse (although his speed is not inconsiderable), in strength with the draught horse (though he can perform collar work moderately well with little training), nor is he, until brought under the controlling influence of man for several generations, and influenced in a particular direction by artificial selection, specially suited for any domestic purpose. The adaptability for work shown by the descendants of horses which have recently gone wild is wonderful. The little training the Australian and American horses receive to enable them to work proves that they have not yet outlived the inheritance of the useful quality of obedience to man. That a traveller should be able to cross South America by impressing wild horses successively to carry him is extraordinary.

In *size* there can be no doubt that (though an enormous fossil horse is supposed to have lived in South America) the tendency of domestication has been towards increase. All the writers, with charming indefiniteness, speak of the wild horses as "small, strong, and not fast."

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* One of his ponies is not a bad shaped one, the other is like a Tapir.

We have rather more accurate information as to their *powers of endurance*, which are undoubtedly considerable; it is not uncommon for an animal to be captured, ridden sixty or seventy miles straight off, and then the animal, tired, not "done up," to be enlarged; this work *on grass feed* is not bad. In some of the revolutions in South America these wild horses have been used extensively and in rather extraordinary ways. Thus Paez, the cavalry leader of Bolivar, broke in wild horses and so mounted a very considerable force, with which on one occasion he performed the extraordinary feat of capturing gunboats in midstream, the men swam their horses in and jumped on board from off the animals' backs. The aquatic powers of horses in this part of the world are remarkable, and it is peculiar that white horses are there thought most of as being the best swimmers.

It is really wonderful how horses can *adapt themselves to emergencies*. Those of Central Asia, for example, have often to live like reindeer, eating snow for drink and gathering a scanty feed by scraping away the snow. Darwin tells us what a hard time of it horses sometimes have in South America. Cattle and horses in time of drought become so exhausted, that when they rush into rivers they are unable to crawl up the muddy banks, and thus are drowned. "All the small rivers become highly saline, and this caused the death of vast numbers in particular spots; for when an animal drinks of such water it does not recover. Azara describes the fury of the wild horses on a similar occasion, rushing to the marshes, those which arrived first being overwhelmed and crushed by those which followed. He adds that more than once he has seen the carcases of upwards of a thousand wild horses thus destroyed." The distinguished naturalist comes to the conclusion that a geologist unacquainted with the occasional occurrence of this phenomenon would draw some conclusions of not altogether satisfactory stability from discovery of a breccia of horse bones.

Yet, in spite of adverse influences, rapidity of spread of horses is a phenomenon of which there can be no doubt. The *diffusion of horses* which in Mexico escaped into the woods and savannahs northward to the Rocky Mountains and to the sources of the Columbia, is, as Low points out, remarkable, yet not to be compared with what has taken place in the plains of La Plata and other parts of the South American Continent. Darwin shows us that whereas the first horse was landed in America at Buenos Ayres in 1537, in 1580 (less than fifty years) the Patagonians had horses. This spread is, of course, not to be compared with the wonderful increase in numbers of horses in general in Australia which has recently been witnessed, but it may be remarked as an illustration of how wild horses spread, that in New South Wales, in 1875, 7,000 wild horses are recorded as having been shot without extermination, and the horse pest has attained such importance as, I believe, to have received legislative notice in some parts of Australia. Our members ought to be able to give us some interesting information in this matter. There is evidence that even in South America the numbers of horses have been materially lessened by the requirements of man recently.

Some curious *eccentricities of wild horses* deserve a passing notice. Darwin remarks on the extraordinary fact that without any apparent reason, and though there is no appreciable difference in climate and soil between the western and eastern parts of the Falkland Islands on which he saw horses, they had never left the eastern part. Another peculiar point is noticed by Azara, the preference of wild horses for the dropping of excrement in or near roads. This, carried out on a large scale, in South America, has an important influence on the procuration of fodder along the main tracks.

Darwin comments on the extreme difficulty of driving large bodies of horses over the South American plains. One remount officer who left Buenos Ayres with 500 had under 20 on arrival at his destination. The animals are excitable, and the approach of a puma, or even a fox, during the night will cause the horses to disperse in every direction, and even a storm will have the same effect (" *Voyage of the Beagle*"). This tendency to wild heedless bolting of large numbers of horses is a phenomenon not unknown to our cavalry officers and those of other nations. I know of one *stampede* of horses of a cavalry regiment mounted on Walers in this country, and two serious stampedes occurred among the Guards' horses and those of the Queen's Bays at Aldershot at the first autumn manœuvres. Paez in Bolivia turned this tendency to valuable account in the War of Independence, for he used to stampede bands of wild horses against the enemy at night. Finally, we may observe that, as the equine animals in South Africa have been noticed to have a curious tendency to "chum" with the Gnu and other ruminants, the wild horse also has been observed on terms of settled friendship with the larger ruminants of the plains on which he is found.

The *paces of the horse* in a natural condition are the walk and gallop. As regards other paces, the amble and the canter are undoubtedly artificial, but it has been much discussed as to whether the wild horse trots. We need not enter into the arguments in detail here. The question has received much attention in America, and Hiram Woodruffe has concluded that the trot is a natural pace for young untrained animals; also zebras and other wild equines trot. There are evident fallacies in this argument, but to debate on the paces of the horse here would take too much time and trespass too much on the patience of the meeting.

Finally, in estimating *the influence on mankind of the wild horse in the present day,* we find a difficulty in separating him from the numerous herds of semi-wild animals which in most parts of the world are utilised as reserves of horse supplies, such as those of the great breeding establishments in Hungary,* Russia, and even in Chinese Tartary. A description of one of the latter by Prejevalsky may prove of interest: "The great Steppe country through which we passed from Doloknor is the pasture land of the Imperial horses. Every herd (*dargu* of the Mongols) numbers 500, and is under an officer; a superior officer is over all." They supply remounts in time of war. These horses are under the average height, their legs and neck thick, head large, and coat long and shaggy, possess wonderful powers of endurance, remaining out in the open in extreme cold, and contenting themselves with the scanty herbage, or, if there be none, with such coarse stuff as camels feed on. In winter the snow serves them for water. They roam almost at liberty over the pasture lands of Northern Kalka and the country of the Chakhars. The larger herds are usually broken up into smaller troops of 10 to 30 mares, led by a stallion, who guards them with the greatest jealousy and never lets them out of his sight. The leaders of them have pitched battles with one another in the spring. Darwin observed a tribe of Indians which was gradually changing from hunters on foot to hunters on horseback, a neighbouring tribe lending them old and inferior horses to prevent their being absolutely starved through want of success in the chase.

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* Mr. Stockinger writes: "Hungary certainly has large breeding establishments which I have mostly seen more than once, but you will not find any animal even approaching the semi-wild state. The largest stud is called Mero Hegyes, which belongs to the Government, and covers an area of about 45,000 acres, numbering between 4 to 5,000 horses.

"They are divided according to breed, age, and sex into small herds numbering 80 to 100 at the utmost. Each herd is driven out to the pasture every morning by two to three well mounted men with long whips, and brought back in the evening into large separate enclosures, each of which contains a shed entirely open on one side.

"They are all perfectly tame, and one could hardly imagine a prettier sight than being surrounded by a flock of thorough bred or half-bred yearlings searching your pockets for bread.

"The stallions are kept in stables all the year round, do the carriage and saddle-work of the superintending officers, and are about as peaceful and tame creatures as one would wish. I have never heard a scream or a kick in a stable containing perhaps 50 or more stallions.

"Large landed proprietors have studs kept very much on the same system; the stallions are either private property or belong to Government, who let them out for the season.

"The small landlord and persant breeds horses as a domestic animal more like the Arab. They are about the house or farm; the boys jump on their backs as soon almost as they can stand on their legs; and he follows his master about like a dog. You will very often see a farmer drive about the country with the offspring and relations of his team after him. I know a good many books contain still accounts of the wild Hungarian horse, but these are things long, long gone by.

"The very natural and surest prof of this is that I have met very, very rarely with an ill-tempered or vicious horse, and then it can be almost invariably traced to bad treatment."

The wild and semi-wild horses constitute together a grand reserve of remounts for the world's requirements. They are absolutely necessary for travelling in many parts; they even constitute a source of food supply to mankind; they give scope for reckless energy of certain classes of mankind which might otherwise find a less legitimate outlet; in some countries, as in primitive ages, skin, hair, hoofs, milk, and bones of horses are found useful. There is doubtless much waste in capture and breaking-in, yet the supplies seem almost inexhaustible, thanks to rapid propagation and wide range over suitable country. Even viewed as a feral animal, there are few quadrupeds more useful to man than Equus caballus; as a domesticable being he is one of the grandest of presents of Nature to mankind.

J. H. S.

Bombay Veterinary College.

ON THE LEPIDOPTERA OF KARACHI AND ITS NEIGHBOURHOOD. (PART I.)

By Col. C. Swinhoe, F.L.S., F.Z.S., &c.

There appears to be no record of any collection of Lepidoptera ever having been made in Karachi or in Southern Sind, beyond a short paper of my own, which appeared in the Proceedings of the Zoological Society of London for 1884, p. 503.

I collected at and about Karachi, from December 1878 up to August 1880, employing (as I always do) the services of a trained native collector, and recorded his captures daily in my journal. There was no sweet water in Karachi then, and but very few and feeble attempts at gardening—little but sand everywhere, and consequently the Lepidopterous fauna was very limited, and mainly limited, as might be expected, to desert forms.

With the introduction of the Mulleer Water Works the whole face of Karachi is rapidly changing—gardens are springing up everywhere, all kinds of new trees are being cultivated, and this change is bringing a number of fresh species of butterflies and moths into the neighbourhood. I received a number of new things from Mr. Murray in 1882, after an unusually heavy rainfall, and during my stay there from the 30th March 1885 to 21st September 1886, I captured many more fresh species, and I now purpose giving a complete list of all the lepidoptera within my knowledge taken at Karachi and its vicinity up to date.

The list of species is still very limited; it will no doubt go on increasing every year with the growth of vegetation, until it somewhat resembles that of Bombay, but in consequence of the sandy nature of its surroundings, Karachi will always contain many desert species, and will lack many of the species which thrive in the moist atmosphere of the Bombay coast. For instance, the genus Ixias, so plentifully represented in Bombay, is entirely absent from Karachi, as also the *eucharis* group of the genus *Callosune*, very abundant in Bombay, is nowhere to be seen about Karachi, whereas, on the other hand, the *dulcis* group of the same genus, and the *dynamene* group of the sub-genus *Idmais* to be met with in abundance in one or other of its species all the year through at Karachi, are only represented in Bombay by very rare specimens of *Callosune taplini* Swinhoe, and *Idmais cyprœa*, Fabr.

PART I.

RHOPALOCERA.

NYMPHALIDÆ.

EUPLOEINÆ.

1. *Tirumala limniace.*

Papilio limniace, Cramer, Pap. Exot. i., pl. 59 f. D. E. (1779)

July 1882, in great plenty after heavy rain, and is now quite a common insect during the months of July and August, since the introduction of the Mulleer water into Karachi and the consequent increase of vegetation.

2. *Salatura genutia.*

Papilio genutia, Cramer, Pap. Exot. iii., pl. 206, f. C. D. (1782).

Is also now becoming a common insect at Karachi during the months of June and July and August.

3. *Limnas chrysippus.*

Papilio chrysippus, Linn., Mus. Ulr., p. 263 (1764).

Common everywhere in Sind all the year round.

4. *Limans dorippus.*

Euplœa dorippus, Klug., Symb. Phys., pl. 48, f. 1-5 (1845).

Never common ; an odd specimen taken occasionally all the year round.

5. *Limans alcippoides.*

Limans alcippoides, Moore, P. Z. S., 1883, p. 238, pl. 31, f. 1.

Same note as above.

SATYRINÆ.

6. *Melanitis leda.*

Papilio leda, Linn., Syst. Nat. i., 2, p. 773 (1767).

A rare insect at Karachi. I took one in 1879 and one in July 1886.

7. *Melanitis ismene.*

Papilio ismene, Cramer, Pap. Exot. i., pl. 26, f. A. B. (1775)

Rare ; one taken by me in May 1886.

8. *Ypthirna asterope.*

Hipparachia asterope, Klug., Symb. Phys., pl. 29, f. 11-14 (1832).

I took one in May 1886 ; it is identical with specimens in my collection from Arabia identified by Mr. A. G. Butler of the British Museum.

NYMPHALINÆ.

9. *Atella phalanta.*

Papilio phalanta, Drury, Ill. Exot. Ent. i., pl. 21, f. 1, 2 (1773).

This is also a rare insect in these parts. I got one at Karachi in July 1882, and received one in a small collection made by Sir Oliver St. John in Kozdar, Beloochistan.

10. *Pyrameis cardui.*

Papilio cardui, Linn., Faun. Suec., p. 276 (1761).

Common throughout the year.

11. *Junonia lemonias.*

Papilio lemonias, Linn., Mus. Ulr., p. 277 (1764).

Taken in November 1885.

12. *Junonia hierta.*

Papilio hierta, Fahr., Ent Syst. Suppl., p. 424 (1798).

Not observed in 1879 or 1880; is, however, becoming common. It was plentiful in several months of the year in 1885 and 1886.

13. *Junonia orithya.*

Papilio orithya, Linn., Mus. Ulr., p. 278 (1764).

A few taken in April and May 1879 and 1880, but is becoming quite common, and was taken in great plenty in June, July and August 1885 and 1886.

14. *Junonia asterie.*

Papilio asterie, Linn., Syst. Nat. i. 2, p. 76. (1767).

One taken in November 1880.

15. *Junonia almana.*

Papilio almana, Linn., Mus. Ulr., p. 272 (1764).

The commonest species of the genus appears in January, April and November.

16. *Hypolimnas bolina.*

Papilio bolina, Linn., Mus. Ulr., p. 295 (1764).

Two specimens in July 1882, one in July 1836, and one in the following month.

17. *Hypolimnas misippus.*

Papilio misippus, Linn., Mus. Ulr, p. 264 (1764).

Common from June to December. The female mimics *Limnas dorippus* more commonly than *L. chrysippus.*

LYCŒNIDÆ.

18. *Polymmatus bœticus.*

Papilio boeticus, Linn., Syst. Not. i. 2, p, 789 (1767).

Common in every month of the year.

19. *Lampides strabo.*

Hesperia strabo, Fahr., Ent. Syst. iii., p. 287 (1793); *Lycœna kandarpa,* Horsfield, Cat. Lep. E. I. C., p. 82 (1829); *Lampides asoka,* Kollar, Hüg. Kasch. iv., p. 419, ♂ 6; *Lampides didda,* Kollar, Hüg. Kasch iv, p. 420, ♂.

Common in July and August.

20. *Catochrysops cnejus.*

Hesperia cnejus, Fahr., Ent. Syst. Suppl., p. 430 (1798).

Common during August, September and October.

21. *Catochrysops contracta.*

Lampides contracta, Mr. Butler, P. Z. S., 1880, p. 406, pl. 34, f. 3.

Common from May to September. Butler's type came from Kandahar ; the Karachi examples are identical with the Kandahar form.

22. *Catochrysops ella.*

Catochrysops ella, Butler, P. Z. S., 1881, p. 606.

Common in December and January.

23. *Tarucus nara.*

Lycæna nara, Kollar, Hüg. Kasch. vi. 2, p. 421 (1848). Common from April to August. A species allied to *T. nara* with attenuated markings on the wings below occur at Karachi in June; it appears to me to be distinct and has yet to be described. I have examples taken in June 1879, in June 1885, and in the Hubb River, taken by Captain Becher, R. A., in September 1885.

24. *Tarucus extricatus.*

Tarucus extricatus, Butler, P. Z. S., 1886, p. 367, pl. 35, f. 2. Taken in May, October and December 1885, and in January and April 1886.

25. *Tarucus plinius.*

Hesperia plinius, Fab., Ent. Syst. iii., 1, p. 284 (1793).

Common in May, June and July.

26. *Zizera trochilus.*

Lycœna trochilus, Freyer, Neuere. Beitr. v., pl. 440, f. 1 (1844).

June 1885, and taken by Captain Becher on the Hubb River in September 1885.

27. *Zizera karsandra.*

Polyommatus karsandra, Moore, P. Z. S., 1865, p. 505, pl. 31, f. 7.

The commonest Lycœna in Karachi. It occurs in great plenty in April and May, and again in countless numbers in November and December.

28. *Zizera mora.*

Zezera mora, Swinhoe, P. Z. S., 1884, p. 506, pl. 47, f. 2.

June 1879 and June 1882.

29. *Zizera pygmæa.*

Lycæna pygmæa, Snellen, Tijdscher., Ent. xix., pl. 7, f. 3 (1876).

July 1882.

30. *Chilades putli.*

Lycæna putli, Koolar, Hüg. Kasch., p. 424 (1848).

Mugger Pir. August, 1880.

31. *Azanus zena.*

Lycæna zena, Moore, P. Z S., 1865, p. 505, pl. 31, f. 9.

Common from July to November.

32. *Azanus uranus.*

Azanus uranus, Butler, P. Z. S., 1886, p. 366, pl. 35, f. 1.

Three taken in August 1886, and one taken by Captain Becher in the Hubb River in September 1885.

33. *Spindasis trifurcata.*

Aphnæus trifurcata, Moore, P. Z. S., 1882, p. 251.

Several taken in the Hubb River by Captain Becher in September 1885.

34. *Spindasis acamas.*

Lycæna acamas, Klüg., Syst. Phys., pl. 40, f. 7-9 (1834).

Common in January and February 1880 and July 1881. One taken in July 1885.

PAPILIONIDÆ.

PIERINÆ.

35. *Terias læta.*

Terias læta, Boisduval, Sp. Gen. i., p. 674 (1836).

One taken in June 1879 is a common insect at Karachi, and is very plentiful in May and June.

36. *Terias hecabe.*

Papilio hecabe, Linn., Mus. Ind. Ulr., p. 249 (1764).

Common from April to August.

37. *Terias hecabeoides.*

Terias hecabeoides, Men., Cat. Mus. Petr. Lep. i., p. 85, pl. 2, f. 2 (1855).

Is also common during the summer months. It is doubtfully distinct from the preceding, its only difference being a heavier marginal border, and in the forewing this border extends further in on the hinder margin.

38. *Terias œsiope.*

Terias œsiope, Men., Cat. Mus. Petr. Lep. i., p. 85, pl. 2, f. 3 (1885).

July and August. This insect is also doubtfully distinct, the two former are free of all red markings on the wings below. *T. œsiope* has red apical patch, below the wings above with its deep border being almost identical with *T. hecabeoides.*

39. *Terias curiosa.*

Terias curiosa, Swinhoe, P. Z. S., 1884, p. 508, pl. 47, f. 3. August, 1879.

40. *Terias excavata.*

Terias excavata, Moore, P. Z. S., 1882, p. 252.

August to January.

41. *Terias purreea.*

Terias purreea, Moore, P. Z. S., 1882, p. 252.

November to January.

42. *Terias asphodelus,* Butler, P. Z. S., 1883, p. 151, pl. 24, f. 13.

November to March.

43. *Terias irregularis.*

Terias irregularis, Moore, P. Z. S., 1882, p. 253, pl. 12, f. 3. January, 1886.

The last four species all have red patches on the wings below; some Lepidopterists think they are all varieties of one species. This may be the case, or else they may be seasonal forms, but they are not difficult to separate, and a long series of them will show very few intermediates.

44. *Terias venata.*

Terias venata, Moore, Cat. Lep. E. I.C. i., p. 65, pl. 2a, F. 2 (1857).

Observed for the first time at Karachi in July 1886, when I took four ; it will probably become as common in a year or two with the increase of vegetation as it is in Bombay.

45. *Idmais fausta.*

Papilio fausta, Oliver, Voy. l'Europ. Atl., pl. 33, f. 4 a. b. (1801).

Never common at Karachi, but an odd one taken occasionally from May to August. The males of this species have a sexual mark on the forewings in the form of a small embossed patch.

46. *Idmais protractus.*

Teracolus protractus, Butler, P. Z. S , 1876. p. 137.

A rare insect here, one taken in Karachi in January and one in March 1879 ; it is common on the Hubb River from July to November, and in great plenty on the banks of the Indus at Hyderabad.

47. *Idmais vestalis.*

Teracolus vestalis, Butler, P. Z. S., 1876, p. 135, pl. 7, f. 10, and 1882, p. 609.

In great plenty from April to June.

48. *Idmais puellaris.*

Teracolus puellaris, Butler, P. Z. S., 1876, p. 136, and 1881, p. 609.

Scarce at Karachi. Common in the interior ; an occasional specimen to be taken from May to August.

49. *Idmais chreipennis.*

Teracolus ochreipennis, Butler, P. Z. S., 1876, p. 136, pl. 1881, p. 609.

Plentiful in December.

50. *Idmais peelus.*

Idmais peelus, Swinhoe, P. Z. S., 1884, p. 439, pl. 39, f. 9.

Taken in May and September.

51. *Idmais dubia.*

Teracolus dubius, Swinhoe, P. Z. S., 1884, p. 439.

July, August and September.

A key to the last six species may be useful.

Above they are all more or less similar, except that *I. puellaris* and *I. dubia* have the marginal black bands on the hind wings deeper than in the other species ; their distinctive differences are in the colouration and markings of the wings below, as under.

I. vestalis, Butler, and *I. puellaris,* males ; both wings below sulphur yellow, forewings with three black spots near outer margin, below the median branches; in *I. vestalis* the centre spot the largest in *I. puellaris* with lowest spot extending downwards and expanding upon the hinder margin; females very similar in appearance, but the band on the hind wings above in *I. puellaris* is, as in the males, deeper than in *I. vestalis,* below the markings are very much as in the male, but the hind wings are flesh colour, the colour being darker in *I. puellaris* than in *I. vestalis.*

I. ochreipennis, Butler, below both sexes with the three spots in the fore wings as in *I. vestalis*; hind wings in both sexes flesh colour.

I. peelus, Swinhoe, is like a yellow *I. vestalis*.

I. dubia, Swinhoe, is like a very large *I. vestalis*, with all the black markings much deeper above and below, with a discal series of large reddish brown spots in the hind wings below.

I. protractus is marked like *I. puelaris* above and below, but is of a deep salmon colour above. There are several other differences between the various species, but by these alone they can be easily separated, and these characteristics appear to be quite constant.

52. *Idmais dynamene.*

Pontia dynamene, Klug., Symb. Phys. pl. 6, f. 15, 16 (1829); *Teracolus carinfer*, Butler, P. Z. S., 1876, p. 138, pl. 7, 8, 89.

Very common all the year round.

53. *Idmais calais.*

Papilio calais, Cramer. Pap. Exot. i., pl. 53, f. C. D. (1779). One taken by Captain Becher at Karachi in June 1885, and is identical with my Aden specimens identified by Mr. Butler.

54. *Callosune dulcis.*

Teracolus dulcis, Butler, P. Z. S., 1876, p. 157, pl. 7, f. 13; *Teracolus dirus*, Butler, l. c. f. 11; *Teracolus eboreoides*, Butler, l. c. p. 1858, pl. 7, f. 12; *Teracolus immaculatus*, Swinh., P. Z. S., 1884, p. 443.

Common from April to August.

Typical specimens of all the above can easily be separated, but there are so many intermediates, it is impossible to separate them as distinct species. *C. dulcis* is the common form, the hind wings below have a complete whorl of small discal brownish spots, and *C. immaculatus*, *C. eboreoides*, and *C. dirus* are larger butterflies. Below on the fore wings are two black patches on the outer margin near the hinder angle. In *C. eboreoides*, the discal spots on the hind wings are double, prominent, complete, and very black; in *C. dirus* these large spots are only represented by two or three pairs from the costa downwards, and in *C. immaculatus* they are entirely absent, there being many only one pair of spots on the costa.

55. *Collosune subroseus.*

Teracolus subroseus, Swinhoe, P. Z. S., 1884, p. 443, pl. 40, f. 67.

July to November.

A good and distinct species, but of this, as of *C. dulcis,* there appear to be some varieties more or less constant. One form has the hind wings below pure white, and in another form the hind wings are shaded with pale purple. I have a long series of all these forms in my collection with many intermediates. *C. subroseus* in its typical rose-coloured form is a very common insect at Ahmedabad.

56. *Callosune etrida.*

Anthocaris etrida, Boird., Sp. Gen. Lep. i., p. 576 (1836).

Teracolus purus, Butler, P. Z. S., 1876, p. 160, pl. 7, f. 14, 15.

Common from April to July.

57. *Callosune pernotatus.*

Teracolus pernotatus, Butler, P. Z. S., 1876, p. 159, pl. 7, f. 1.

July, August and September.

58. *Callosune farrinus.*

Teracolus farrinus, Butler, P. Z. S., 1876, p. 159, pl. 7, f. 2.

May to September.

59. *Callosune limbatus.*

Teracolus limbatus, Butler, P. Z. S., 1876, p. 161.

June 1880 to October 1885.

C. etrida has the underside of the hind wings immaculate, *C. limbatus* (common in Ceylon) is similar, but has the black band on hind wings above entire and not macular.

C. pernotatus has a whorl of pale blackish rather diffused discal spots on the hind wings below, and so has *C. farrinus,* but the latter is a larger insect, and has all its black markings deeper; the inner black band of the orange apical patch on the fore wings above is broad, and the black macular marginal band of the hind wings above consists of large spots, sometimes like black patches.

I am inclined to think there are only two, not four, species; but the types of each are very distinct in appearance, and until proof can be produced they must stand.

60. *Callosune bimbura.*

Teracolus bimbura, Butler, P. Z. S., 1876, p. 161, pl. 7, f. 3, 4.

December, January and February.

The type came from Bimbur in Cashmir, but it is common during the cold weather in the plains all over Western and Southern India; above it is like a finely marked *C. etrida;* below the hind wings (excepting the discoidal cell) are pinkish suffused with brown atoms, the discoidal cell standing out pale whitish in the pinkish brown colouration.

61. *Belenois mesentina*—

Papilio mesentina, Cramer, Pap. Exot iii., pl. 27, f. A. B. (1782).

Pieris lordaca, Walker, Entom. v., p. 48 (1870).

Belenois auriginea, Butler. P. Z. S., 1886, p. 374.

Common from February to June.

The females are mostly of the *B. lordaca* form. Mr. Butler has lately split the Indian form of this species into three species, but I cannot follow him, with a very long series from all parts of India, including many from the Punjab, from whence his types of *B. lordaca* and *B. auriginea* came. I cannot separate the three forms though I can pick out typical specimens of all these. The only conclusion to arrive at appears to me to be that *B. mesentina* is a very variable species.

62. *Catopsilia pyranthe.*

Papilio pyranthe, Linn., Mus. Ulr., p. 245 (1764).

May to August common.

63. *Catopsilia ilea.*

Papilio ilea, Fab., Ent. Syst. Suppl., p. 426 (1798).

May and June.

64. *Catopsilia philippinia*—

Papilio philippinia, Cram., Pap. Exot. iv., pl. 361, f. C. D. (1782).

Common from September to January.

65. *Catopslia crocale.*

Papilio crocale, Cram., Pap. Exot. i., pl. 55, f. C. D. (1779).

One taken in 1879, another in July 1882. It is now more common during the months of June and July.

PAPILIONINÆ.

66. *Menelaidesar istolochiæ.*

Papilio aristolochiæ, Fab., Ent., Syst., p. 443 (1775).

Paplio diphilus, Esper., Ausl. Schmitt, pl. 40, B. f. 1. (1785-98).

Very common in July and August.

67. *Ophides erithonius.*

Papilio erithonius, Cram., Pap. Exot. iii., pl. 232, f. A. B. (1782).

Common all the year round.

Hesperidæ,

68. *Parata alexis.*

Papilio alexis, Fab., Syst. Ent. p. 533 (1775).

One example, July 1882.

69. *Badamia exclamationis.*

Papilio exclamationis, Fab., Syst. Ent., p. 530 (1775).

One example, June 1885.

70. *Chapra midea.*

Pelopidas, midea, Walker, Entom. v., p. 56 (1870).

Common at all seasons. This is the large pale form of *Chapra mathias,* Fabr. I have received it also from Khozdar in Beloochistan from Sir O. St. John. Walker's type came from Turkey.

71. *Parnara bevani.*

Hesperia bevani, Moore, P. Z. S., 1878, p. 688.

July 1887 and October 1885.

72. *Gegenes karsana.*

Hesperia karsana, Moore, P. Z. S., 1874, p. 576, pl. 67, f. 6.

April to October.

73. *Pyrgus galba.*

Hesperia galba, Fab., Ent. Syst. iii. 1. p. 352 (1793).

Prygus superna. Moore, P. Z. S., 1865, p. 792.

June to September.

74 *Pyrgus evanidus.*

Pyrgus evanidus, Butler, Ann. and Mag. Nat. Hist. March 1880, p. 223.

January, February and March.

75. *Gomalia litoralis.*

Gomalia litoralis, Swinhoe, P. Z. S., 1884, p. 513, pl. 47, f. 4.

July 1879.

LIST OF BIRDS' EGGS IN THE SOCIETY'S COLLECTION.

Jerdon's No.	Scientific Name.	Popular Name.	No. of Eggs.
2	Otogyps calvus, Scop	The King Vulture	1
4 *bis.*	Gyps pallescens, Hume	The Long-billed Pale Brown Vulture.	1
5	Pseudogyps bengalensis, Gm	The White-backed Vulture	4
6	Neophron ginginianus, Lath	The Scavenger Vulture	1
11	Falco juggur, J. E. Gr.	The Jugger Falcon	1
23	Astur badius, Gm.	The Shikra	2
29	Aquila vindhiana, Frankl	The Tawny Eagle	3

Jerdon's No.	Scientific Name.	Popular Name.	No. of Eggs.
33	Nisaëtus fasciatus, Vieill.	The Crestless Hawk Eagle	1
35	Limnaëtus cirrhatus, Gm.	The Crested Hawk Eagle	1
42	Haliaëtus leucoryphus, Pall.	The Ring-tailed Fishing Eagle.	2
48	Butastur teesa, Frankl.	The White-eyed Buzzard	2
56	Milvus govinda, Sykes	The Pariah Kite	16
69	Bubo bengalensis, Frankl.	The Rock Horned Owl	5
70	Bubo coromandus, Lath.	The Dusky Horned Owl	1
76	Carine brama, Tem.	The Spotted Owlet	5
84	Hirundo filifera, Steph	The Wire-tailed Swallow	1
85	Hirundo erythropygia, Sykes	The Red-rumped Swallow	1
86	Hirundo fluvicola, Jerd.	The Indian Cliff Swallow	2
90	Ptyonoprogne concolor, Sykes.	The Dusky Crag Martin	1
100	Cypsellus affinis, J. E. Gr.	The Common Indian Swift	5
103	Colocalia unicolor, Jerd.	The Edible Nest Swiftlet	2
112	Caprimulgus asiatica, Lath.	The Common Indian Nightjar.	4
114	Caprimulgus monticulus, Frankl.	Franklin's Nightjar	2
117	Merops viridis, Lin.	The Common Indian Bee-eater.	3
118	Merops philippinus, Lin.	The Blue-tailed Bee-eater	1
121	Merops apiaster, Lin.	The European Bee-eater	1
123	Coracias indica, Lin.	The Indian Roller	4
125	Coracias garrula, Lin.	The European Roller	1
129	Halcyon smyrnensis, Lin.	The White-breasted Kingfisher.	1
134	Alcedo bengalensis, Gm.	The Indian Kingfisher	3
144	Ocyceros birostris, Scop.	The Common Grey Hornbill	2
148	Palæornis torquatus, Bodd.	The Rose-ringed Paroquet	3
149	Palæornis purpureus, P. L. S. M.	The Rose-headed Paroquet	1
160	Picus mahrattensis, Lath.	The Yellow-fronted Woodpecker.	1
164	Yungipicus nanus, Vig	The Southern Pigmy Woodpecker.	1
193 *bis.*	Megalæma inornata, Wald	The Western Green Barbet	1
212	Coccystes jacobinus, Bodd.	The Pied Crested Cuckoo	2
214	Eudynamis honorata, Lin.	The Indian Koel	4
217	Centrococcyx rufipennis, Ill.	The Indian Coucal	4
234	Cynnyris asiatica, Lath.	The Purple Honey-sucker	5
256	Lanius lahtora, Sykes	The Indian Grey Shrike	2
257	Lanius erythronotus, Vig.	The Rufous-backed Shrike	6
260	Lanius vittatus, Valenc.	The Bay-backed Shrike	5
265	Tephrodornis pondiceriana, Gm.	The Common Wood Shrike	3
268	Volvocivora Sykesi, Strickl.	The Black-headed Cuckoo Shrike.	1
276	Pericrocotus peregrinus, Lin.	The Small Minivet	3
277	Pericrocotus erythropygius, Jerd.	The White bellied Minivet	2
278	Buchanga atra, Herm.	The King-Crow	5
288	Muscipeta paradisi, Lin.	The Paradise Fly-Catcher	1
292	Leucocerca aureola, Vieil.	The White-browed Fantail	4
343	Myiophoneus temmincki, Vig.	The Idle Schoolboy	2
354	Geocichla cyanotis, Jerd.	The White-winged Ground Thrush.	2
385	Pyctoris sinensis, Gm.	The Yellow-eyed Babbler	4
389	Alcippe poiocephala, Jerd.	The Quaker Thrush	2
397	Dumetia hyperythra, Frankl.	The Rufous-bellied Babbler	2
432	Malacocercus terricolor, Hodgs.	The Bengal Babbler	1
435	Malacocercus somervillei, Sykes.	The Rufous-tailed Babbler	2
436	Argya malcolmi, Sykes	The Large Grey Babbler	10
438	Chatarrhœa caudata, Dum.	The Striated Bush Babbler	20
452	Ixus luteola, Less	The White-browed Bush Bulbul.	1
460 *bis.*	Otocompsa fuscicaudata, Gould.	The Southern Red-whiskered Bulbul.	2
462	Molpastes, hœmorrhous, Gm.	The Common Madras Bulbul	18
468	Iora tiphia, Lin.	The White-winged Iora	2
470	Oriolus kundoo, Sykes	The Indian Oriole	3
475	Copsychus saularis, Lin.	The Magpie Robin	2

Jerdon's No.	Scientific Name.	Popular Name.	No. of Eggs.
479	Thamnobia fulicata, Lin.	The Indian Black Robin	3
480	Thamnobia cambaiensis, Lath.	The Brown-backed Indian Robin.	4
505	Rhyacornis fuliginosa, Vig.	The Plumbeous Water Robin	1
530	Orthotomus sutorius, Forst	The Indian Tailor Bird	5
535	Prinia stewarti, Bly.	Stewart's Wren Warbler	3
538	Prinia gracilis, Frankl.	The Malabar Wren Warbler	23
539	Cisticola cursitans, Frankl.	The Rufous Grass Warbler	2
543	Drymœca Inornata, Sykes	The Common Wren Warbler	20
545	Drymœca sylvatica, Jerd.	The Jungle Wren Warbler	4
546	Drymœca neglecta, Jerd.	The Allied Wren Warbler	1
551	Franklinia buchnani, Bly.	The Rufous-fronted Wren Warbler.	3
582	Sylvia affinis, Bly.	The Lesser White Throat	1
589	Motacilla madraspatensis, Gm.	The Pied Wagtail	2
631	Zosterops palpebrosa, Tem.	The White-eyed Tit	1
660	Corvus macrohynchus, Wagl.	The Bow-billed Corby	8
663	Corvus splendens, Vieill	The Common Indian Crow	2
674	Dendrocitta rufa, Scop	The Common Indian Magpie.	2
682	Sturnus nitens, Hume	Hume's Starling	1
684	Acridotheres tristis, Lin.	The Common Myna	3
685	Acridotheres ginginianus, Lath.	The Bank Myna	4
687	Sturnia pagodarum, Gm.	The Black-headed Myna	4
694	Ploceus philippinus, Lin.	The Common Weaver Bird	13
699	Amandina punctulata, Lin.	The Spoted Munia	1
703	Amandina malabarica, Lin.	The Plain Brown Munia	14
706	Passer domesticus, Lin.	The House Sparrow	13
756	Mirafra erythroptera, Jerd.	The Red-winged Bush Lark	2
760	Pyrrhulauda grisea, Scop	The Black-bellied Finch Lark.	3
765	Spizalauda deva, Sykes.	The Small Crown Crest Lark.	1
788	Columba intermedia, Strick.	The Blue Rock Pigeon	2
794	Turtur cenegalensis, Lin.	The Little Brown Dove	6
795	Turtur suratensis, Gm.	The Spoted Dove	2
796	Turtur risorius, Lin.	The Common Ring Dove	5
802	Pterocles exustus, Tem	The Common Sand Grousu	4
803	Pavo cristatus, Lin.	The Pea-Fowl	2
808 *oct.*	Megapodius nicobaricus, Bly.	The Nicobar Mound Bird	1
814	Galloperdix spadiceus, Gm.	The Red Spur-Fowl	1
819	Francolinus pictus, Jerd.	The Painted Partridge	1
822	Ortygornis pondicerianus, Gm.	The Grey Partridge	2
826	Perdicula asiatica, Lath.	The Rock Bush Quail	2
830	Coturnix coromandelica, Gm.	The Black-breasted Rain Quail	5
832	Turnix taigoor, Sykes	The Black-breasted Bustard Quail.	6
839	Sypheotides aurita, Lath.	The Likh	1
843	Glareola lactea, Tem.	The Small Swallow Plover	2
855	Lobivanellus indicus, Bodd.	The Red-wattled Lapwing	13
856	Lobipluvia malabarica, Bodd.	The Yellow-wattled Lapwing.	3
858	Æsacus recurvirostris, Cuv.	The Large Stone Plover	1
859	Ædicnemus scolopax, S. G. Gm.	The Stone Plover	2
863	Grus antigone, Lin.	The Sarus	4
900	Parra indica, Lath.	The Bronze winged Jacana	6
901	Hydrophasianus chirurgus, Scoh.	The Pheasant-tailed Jacana	5
902	Porphyris poliocephalus, Lath.	The Purple Coot	1
903	Fulica atra, Lin.	The Coot	1
905	Gallinula chloropus, Lin.	The Moor Hen	3
907	Erythra phænicura, Penn.	The White-bellied Water Hen.	5
909	Porzana maruetta, Leach	The Spotted Crake-Hen	1
913	Hypotinidea striata, Lin.	The Blue-breasted Rail	1
920	Dissura episcopa, Bodd.	The White-necked Storke	1
925	Herodias torra, B. Ham.	The Large Egret	3
926	Herodias intermedia, Huss	The Small Egret	3
927	Herodias gazata, Lin.	The Little Egret	1
929	Bubulcus coromandus, Bodd.	The Cattle Egret	6
930	Ardeola grayi, Sykes	The Pond Heron	3

Jerdon's No.	Scientific Name.	Popular Name.	No. of Eggs.
933	Ardetta cinnamomea, Gm.	The Chesnut Bittern	4
937	Nycticorax grisea, Lin	The Night Heron	3
938	Tantalus leucocephalus, Forst ...	The Pelican Ibis	1
939	Platalea leucorodea, Lin.	The Spoonbill Heron	7
940	Anastomus oscitans, Bodd.	The Shell Ibis	6
941	Ibis melanocephala, Lath.	The White Ibis	7
944	Phœnicopterus antiquorum, Tem.	The Flamingo	1
950	Sarcidiornis melanonotus, Penn.	The Comb Duck	1
969	Fuligula nyroca, Guld.	The White-eyed Pochard	2
975	Podiceps minor, Gm.	The Dabchick	7
984	Hydrochelidon hybrida, Pall. ...	The March Tern	2
985	Sterna seena, Sykes	The Large River Tern	6
988 *ter*.	Sterna saundersi, Hume.	Saunder's Little Tern	3
1004	Pelecanus philippensis, Gm.	The Grey Pelican	4
1008	Phalacrocorax fuscicolis, Step..	The Lesser Cormorant	2
1008	Plotus melanogaster, Penn.	The Snake Bird	5

ZOOLOGICAL NOTES.

NOTES ON A HORN ON THE MARGIN OF A GOAT'S EAR.

By Veterinary-Surgeon J. H. Steel, Superintendent, Bombay Veterinary College.

This specimen, presented by Colonel Biddulph, was obtained in Deoli (Rajputana). The head is a fine one of black colour and having two spiral horns well developed, of even twist and backward and outward slope; the ears are long, broad, and pendant, covered externally with short black hair and internally having a fair quantity of long straight hair near the margins. The peculiarity affects the posterior margin and both the surfaces of the right ear at about the middle third of the margin, a distance of some three inches from the tip. On the outer surface a semicircle of the skin about half an inch in diameter has undergone warty change, forming an irregular horny mass, the area of which is extended by the circular base of the horn which grows from the inner surface. The base of the horn is about 1½ in. in diameter, it has hairs growing from among the horny material and a small irregular projection like the commencement of another horn on a smaller scale. The horn is in the main conical, about 5 in. in length, and curls slightly outwards at its tip, its growth is by concentric rings and its texture is distinctly fibrous, but less regular than that of ordinary horns. Its attachment to the ear seems firm enough, but only by a very small portion of its base, and looks so imperfect that the Honorory Secretary, in handing me the specimen, implored me, whatever I did, not to let the horn come off the ear. The base is not quite circular, being prolonged somewhat supero-internally. The growth seems a genuine natural though irregular one, and we are informed in the letter which accompanied the head that there was another irregular horn on one of the limbs; thus the animal seems to have had a tendency to such growths (*keratogenous diatheses*). There are many such cases on record both in man and in the lower animals, but irregularities of this nature are always worthy of careful examination and record, for irregular horns may be of several different kinds:—

I.—Commemorative or Atavisms.—Recurrences to original type, as when individuals of hornless breeds of cattle develope horns ; true frontal horns as occasionally seen in horses may serve to illustrate affinities or possibilities of future development.

II.—Degenerated Organs.—Horns about the limbs are generally of this nature, and somewhat resemble the "warts" of the fore and hind limbs of the horse, the rudimentary claws of cattle. It would have been of interest to know whether the horn of the limb of this goat was a degenerated limb or not.

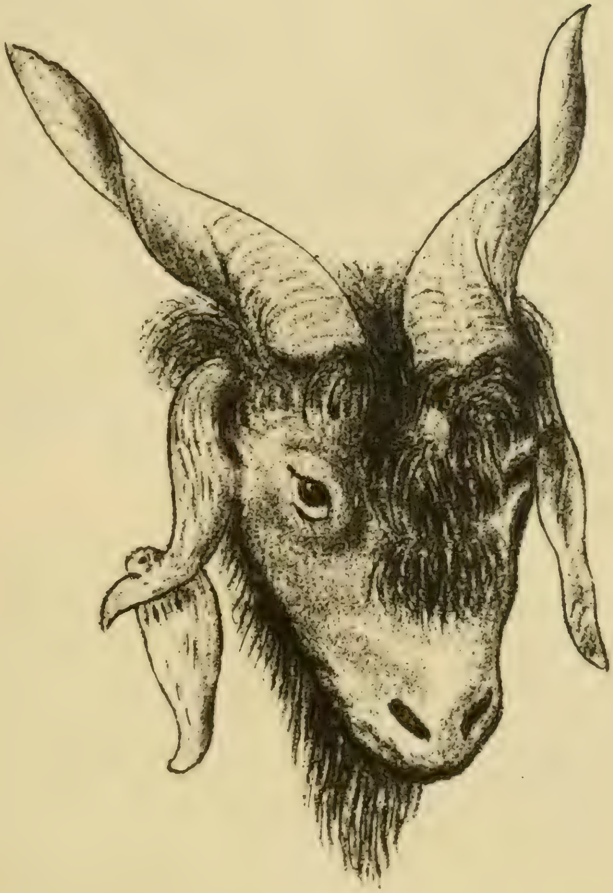
III.—Accidental displacements of normal horns.

IV.—Simple warty growths.—Thickenings of the epithelium assuming a horny character, and physically compelled to become conical in forms known to cutaneous surgeons as cornua.

V.—Compensatory.—Developed as atonement for loss of these natural means of offence and defence ; as in the case of which I show a drawing made by me from the original in the Museum of the Royal Veterinary College of London. The horn of a cow was broken, and from the side of the stump shot out at right angles a true young hollow horn, a phenomenon of sprouting which is most remarkable in an animal so high in the scale as the ox.

VI.—Physiological.—Such as the natal collosities of the monkeys (seen also in old and ill-tended dogs) and the horny pads of the knees, stifles, elbows, and brisket of the camel.

In the case in question the horn is neither commemorative nor a degenerated organ, for it is not natural to any animals allied to the goat to have horns on their ears, It is not compensatory, for the ordinary horns of the animal are well developed ; we have no reason to believe it could have been produced to meet a physiological emergency. It might have been a horn the skin to form which had accidentally before birth become transferred by grafting from the frontal region to an ear resting against it, but in that case the ordinary frontal horn should be deficient or defective, which is not the case. Loose frontal horns of cattle are very common especially in the more improved breeds and in females, rather than males, the core of the horn then degenerates at its root into a simple ligament or disappears, altogether, and the organ may be far detached from its normal position. We have no evidence of such being the case here, but the reverse, for the ordinary horn occupies the usual position. We are thus, by exclusion, compelled to fall back on the view that we have to deal with a keratoma or horn tumour, an epidermal growth assuming the form of a conical horn. I have found recorded among my notes a case of "a horn on the tip of a cow's ear," as described by a professional friend of mine who saw the animal alive, which probably was of the same nature as this. Warts on the ears of cattle are by no means rare and keratoid growths are often dealt with in works on surgery and of the skin. Bland Sutton has recently brought out an interesting paper on the subject in the Journal of Comparative Medicine and Surgery.



CUTANEOUS HORN

ON THE EAR OF A DOMESTIC GOAT.

Received from Col. J. BIDDULPH, *Deoli, Rajputana.*

NOTES ON THE FOOD OF THE PANTHER (*FELIS PARDUS*).

The following notes on the food of the panther may be of interest:—

When walking through a jungle in the district of Canara I came upon the fresh tracks of a panther, and following these tracks a short way, I found some fresh panther's droppings, embedded in which were the remains of a large black scorpion. It was evident from the way in which the scorpion's remains were embedded in the droppings that the panther had eaten and partly digested the scorpion.

On another occasion I had a chance of noting the food of panthers. A male panther was shot measuring 7 feet from the tip of nose to end of tail, while the girth measurement behind the fore legs was less than that of another panther, a cub, measuring something under 6 feet. The panther was in miserable condition, the cause of which seems to have been the presence of three porcupine's quills embedded in his body. Of these quills one was in the ball of the right forefoot, one a short distance up the left fore leg, and the third between the ribs close behind the shoulder. The quills were all broken, a length of about 3 inches remaining in the wounds. Around each wound the flesh was much inflamed. Panthers will also eat rats, and are very quick at catching them, which they do with both mouth and paws.

H. S. WISE.

NOTES ON THE CHEETAL.

A Poona correspondent wrote to us as follows, in July last:—

" I have a few Cheetal, or Spotted Deer (*Axis maculatus*) in an enclosure in my, garden, very tame, and they breed regularly. A stag fawn was born in the month of May last, and, with its dam and companion, would come up and literally beg rising on its hind legs for bread, biscuits and vegetables, offered by any visitor. Last week the river rose, the banks fell, and it became necessary to remove the deer from their enclosure to my stables. The fawn followed its dam, being left out of its enclosure, when something startled the little fellow and he jumped into the raging stream just opposite the Boating Terminus called *Rosherville*. Carried off his legs he swam vigorously across, and, so far as we could see, landed about a quarter of a mile below on the Rosherville bank. It was sundown, and we gave the animal up as lost. All we could do was to send round and warn the villagers and police. In the middle of the night, I heard the dam calling, and in the morning learnt that our little friend, who must have gone right up to Holkar's Bridge for the purpose, had swam across, about 2 a.m., and joined his mother to the great alarm of the sentries, who thought it was a panther visiting them.

PROCEEDINGS OF THE MONTHLY MEETING HELD ON 4TH JULY 1887.

The Hon. Mr. Justice Birdwood presided.

The following new members were elected:— H. H. Prince Joravarkhanji of Bajana, Mr. E. von Hantelmann, Dr. W. Kay, Mr. A. C. Walker, Mr. F. E. Dempster, Mr. F. L. Charles, C.S., Mr. W. N. Fleming, Capt. E. G. Reilly, Mr. C. F. Whyte, Mr. G. de Soane, Mr. G. Sutton Jones, Capt. Pentland, Capt. Butler, and Mr. A. de Gama.

CONTRIBUTIONS TO THE SOCIETY'S COLLECTIONS.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions to the Society's collections since the last meeting:—

Contribution.	Description.	Contributor.
2 Tigers' Skulls	Felis tigris	Capt. T. Macpherson
1 Panther's Skull	Felis pardus	Do.
1 Snake (alive)	Depdrophis picta	Mr. F. Gleadow.
1 Snake (alive)	Zamenis fasciolatus	Mr. T. Maclurcan.
1 Snake (alive)	Dipsas gokool	Mr. M. C. Turner.
1 Black Bear (alive)	Ursus labiatus	Mr. A. C. Walker.
2 Field Mice	Golunda elliotti	Mr. F. Gleadow.
1 Four-horned Antelope	Tetraceros quadricornis	Victoria Gardens.
A quantity of Insects	From Belgaum	Mr. H. E. Andrewes.
1 Snake (alive)	Python molurus	Mr. C. F. G. Lester.
1 Pintail Grouse (alive)	Pterocles alchata	Do.
A quantity of Butterflies.	From Raipur, C. P.	Mr. J. A. Betham.
1 Panther	Felis pardus	Victoria Gardens.
1 Snake	Gongylophis conicus	Capt. J. B. Peile.
1 Snake	Lycodon aulicus	Do.
A quantity of Butterflies	From Ceylon	Mr. A. P. Green.
Birds' Eggs and Nests	From Saugor, C. P.	Lieut. H. E. Barnes.
1 Snake	Onychocephalus acutus	
1 Spotted Owlet (alive)	Carine brama	Mr. H. Johnston.
A large piece of Coral	From the Red Sea	Mr. M. H. Starling.
2 Snakes	Naga tripudians	Mr. F. Kirby.
1 Black Buck	Antelope bezoartica	Victoria Gardens.
36 Birds' Skins	From Cutch	H. H. the Rao of Cutch.
1 Crested Serpent Eagle	Spilornis cheela	Mr. W. F. Sinclair, C.S.
1 Jungle Cat's Skin	From Alibag	Do.
1 Chinkara	Gazella bennetti	Mr. E. von Hantelman.
1 Snake	Bungarus arcuatus	Capt. J. B. Peile.
1 Fœtus of Black Buck	Antelope bezoartica	Do.
1 Skull of Black Bear	Ursus labiatus	Dr. Bridges.
A quantity of Reptiles	From Upper Burmah	Signor L. Tea.
A Skin and Skull	Of Black Panther	Col. W. Peyton.
A curiously deformed Hind Foot.	Of Black Buck	Mr. R. A Straw.
1 Snake	Echis carinata	Mr. E. von Hantelmann.
Fossil Tooth of a Mastodon	From Bhownugger	H. E. the Lady Reay.
A number of other Fossils	Do.	Do.
1 Lizard	Sitana minor	Father Dreckmann.
A number of Marine Animals.	From the Mergui Archipelago,	Mr. F. J. Daley.
2 Snakes	Bungarus arcuatus and Dipsas gokool.	Mr. T. Bromley, Jun.
1 Lizard	Eublepharis hardwickii	Lieut. H. E. Barnes.
1 Stuffed Albatross		Mr. C. F. Davur.
A quantity of Snakes' Eggs	Tropidonotus quincunciatus.	Mr. Thos. Hayter.
3 Sketches of the Talipot Palm.	Corypha umbraculifera	Mr. T. A. Le Mesurier.
1 Goat's Head	With a 5-in. horn on tip of the ear.	Col. J. Biddulph.
1 Skin of Spotted Deer	Axis maculatus	Mr. E. von Hantelmann.
A fine Specimen of Coral.	From the Red Sea	Mrs. Goldwyer Lewis.
1 Golden Pheasant (alive)	From Shanghai	Mr. Thos. Lang.
13 Birds' Skins	Do.	Mr. A. J. M. Inverarity.
1 Musk Deer's Skull	Do.	Do.
1 Turtle (alive)	Caouana olivacea	Mr. W. F. Sinclair, C.S.
1 Python (alive)	Python molurus	Father Dreckmann.
1 Sooty Tern	Sterna fuliginosus	Mr. W. F. Sinclair, C.S.
1 Striped Hyæna	Hyæna striata	Victoria Gardens.
1 Black Buck's Head	Horns, 24 inches	Mr. T. Le Mesurier.

Contribution.	Description.	Contributor.
1 Panther's Skull	Felis pardus.........	Mr. G. F. Blackwell.
A quantity of Snakes	From Pindi and Lahore...	Major Yerbury, R.A.
3 Hedgehogs (alive)	Erinaceus collaris	Do.
1 Spotted Hyæna's Skull .	From Somali Coast	Lt. H. G. Swayne, R.E.
A quantity of Snakes and Fish.	From Aden	Capt. W. Aves.
A quantity of Shells.........	From Perim Island.........	Do.
Skull and Horns of Oryx...	From Somali Coast.........	Do.
A quantity of Sea Snakes and other Marine Animals.	From Persian Gulf.........	Capt Bishop.
2 Avocets	Recurvirostra avocetta ...	Mr. E. F. Ansell.
1 Slender Loris	Loris gracilis	Victoria Gardens.
1 Snake	Bungarus arcuatus	Mr. John Fleming.
6 Birds' Eggs	From Yercaud	Mr. Wm. Mahon Daly.
A number of Fish and Marine Animals.	From Alibag	Mr W. F. Sinclair, C.S.

Contributions to the Library.

Manual of Scientific Terms (Stormonth), by Mr. F. Gleadow.

Magazine of Natural History, Vol. 19, Nos. CXII. to CXIV, by Mr. H. Littledale.

Vertebrate Zoology of Sind (Murray), by Mr. E. S. Johannes.

Insect Transformation, by Major Yerbury, R.A.

Entomologist's Text Book (Westwood), by Major Yerbury, R.A.

Papillons Exotiques (Cramer), by Major Yerbury, R. A.

Monograph of the Callidryas (Butler), Do.

Transactions of the Zoological Socy. for 1886, Do.

Reise in Nerdost Afrika (Henglin), Do.

Bulletin of American Natural History, Vol. I. No. 8 (in exchange).

Buffon's Natural History, by Mr. J. A. Betham.

Records of the Geological Survey (in exchange).

Minor contributions received from Mr. A. S. Panday, Mr R. Wylie, Mr. A. S. M. Ritchie, Mr. Kirby Johnston, Mr. Geo. Ormiston, Mr. J. Leask, and Mr. E. Calthrop.

Mr. J. H. Steel read a note on the head of a domestic goat which had a large cutaneous horn on the ear, received from Col. J. Biddulph. This note will be found in Zoological Notes, on page 283 in this number, which also contains a sketch of the head.

He also read a note on a deformed hoof of a Black Buck, received from Mr. R. A. Straw, appearing under Zoological Notes.

Mr. Steel made the following remark—

On the Deformed Canine Tooth of a Tiger.

Here we have in a tiger's skull, exhibited by Mr. G. Sutton Jones, of Deoli, another illustration of the effects of injuries on wild animals. I take it that a considerable time ago this tiger broke his canine tooth off rather short and had a very bad tooth-ache as a result. We can see the surface of the fracture although it had been smoothed off at the edges by friction during the long period since the original injury. We can also see that after the injury the tooth grew thicker than is natural, less smooth and regular, and the tooth socket became enlarged and the bones around it swollen. These are indications that both the tooth-producing membrane and the bone near it were inflamed. Gradually, since this disease subsided, there has been a return to normal conditions, yet even now the socket is larger and not quite the shape of its fellow, the bone around it is swollen, and the canine tooth is very different in appearance from an uninjured one, although certainly more formidable to the eye and probably little less efficient for use.

Dr. Kirtikar, in referring to Mr. Steel's paper on the adventitious horn from the ear of a goat, said that in his opinion Mr. Steel's remarks regarding its origin were correct. The growth was of epidermal origin—arising from the layer of cells covering the true skin. There was a specimen of such a growth occuring in human beings in the Museum of Grant Medical College. The growth was shown as distinctly horny in one of Tuson's wax models which adorn the College Museum. Whether Tuson prepared it from an actually living specimen, or whether it was merely diagramatic, he was not prepared to say. It was on the back of the forearm just a little above the wrist joint, and appeared to be of epidermic origin. That such errors of nature have the horny element in them is undoubted. It was merely a modified form of the epithelial tissue.

VEGETABLE LIFE IN VEHAR WATER.

Dr. Kirtikar next showed under the microscope two specimens of algæ from Vehar water. One of them was the *Pleurococcus Pleuvialis* and another contained the *Protococcus pluvialis* and a minute variety of Nostoc. They were both magnified five hundred times.

During the course of his observations Dr. Kirtikar remarked that the first specimen of *Pleurococcus pluvialis*, Fig. 4, Pl. II, was obtained from the Vehar pipe in the Jamsetji Jijibhai Hospital. It first appeared soon after the first fall of rain in Bombay and its suburbs, and has been since seen floating as green matter in the water served at the Jamsetji Hospital through the Vehar pipes. Whether the plant came from the Vehar Lake itself as a fresh growth from old plants, or whether the rainfall had introduced it afresh, or whether it was from the special pipe of the hospital, he was not prepared to say. He had just been kindly promised by Dr. Weir, who was then among the members present, that a supply of water direct from the Vehar Lake would be submitted to him for a further microscopical examination, to elucidate that point. The algæ, Dr. Kirtikar observed, were visible to the naked eye as irregular. floating green masses. Under the miscroscope their full structure was apparent Beautiful green masses, circular, but some hexagonal by pressure, covered over with a fine hyaline coating congregated in masses, hence being called "pleurococci," containing gonidia, in the shape of brilliant green granular matter. The masses were like "families" collected, and held together by a hyaline mass of cellular matter distinct and irregular in shape. There was some among the individual pleurococci which were like the figure eight, distinctly showing the process of multiplication by *fission*—one cell dividing into two, each of these again sub-dividing further. In the condition of the plant the present gonidia had not separated or escaped from the teguments, so it was not possible to determine whether the gonidia were ciliated or not.

With regard to the next specimen, Fig. 5, Pl. II., Dr. Kirtikar observed that he had searched through the illustrations of Kutzing, the German Algologist, and through the Plates recently published by Cooke; but that he had failed to find such minute arrangement of cells forming the filaments of the Nostoc. The protococcus which was seen in the field of the specimen was a variety of the ordinary *Protococcus pluvialis* but the Nostoc was of a rare beauty and structure. It did not come direct from the Vehar water, but was found growing along the sides and bottom of a bottle in which Vehar water had been stagnant for some days. The bottle was originally clean and the water was used for wetting postage stamps. Where the plant came from it is difficult to say. The *trichome* (filament formed from a stringed arrangement of minute unilocular cells—green in colour) was included in a very fine sheath, highly transparent. The filaments were not branched. The extreme minuteness of it was the point of interest about it, so that the Vehar Lake was not only important to its being a good supplier of excellent water, but that it was of interest to the man of science also.

Dr. Weir thanked Dr. Kirtikar for his contribution and expressed a hope that it would not be his last microscopic examination of Vehar water, but that from time to time he would give the Society the advantage of his repeated examinations.

The Hon'ble Mr. Birdwood concurred.

PROCEEDINGS OF THE MONTHLY MEETING HELD ON 1ST AUGUST 1887.

Dr. Kirtikar presided.

The following new members were elected:—Mr. Arthur Crawford, C.S., Mr. H. R. King, Captain M. J. Meade, Mr. B. Robertson, C.S. and Mr. R. A. Straw.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged the following contributions to the Society's collections:—

Contribution.	Description.	Contributor.
1 Water Tortoise	From Persian Gulf.........	Mr. H. B. Hooper.
A number of Hemipterous Insects.	From Belgaum	Mr. H. E. Andrews.
1 Chameleon	Chameleo vulgaris........	Mr. J. C. Burke.
1 Snake (alive)	Dipsas gokool	Mr. J. Fleming.
Foetus of Goat	Curiously deformed	Dr. T. Weir.
1 Lizard (alive)	Varanus dracœna	Mr. Alfred Walker.
1 Snake's skin	Python reticulatus from Mergui Archipelago.	Messrs. Searle, Lamb and Pickard.
2 Crocodiles (alive)	Crocodilus palustris	Mr. E. P. Close.
3 Jerboa Rats (alive)	. ...	Do.
1 Lemur	.....	Sergt.-Major Webb.
A quantity of Fish and Marine Animals.	From Alibag	Mr. W. F. Sinclair, C.S.
49 Birds' Skins	From Cashmere	Captain J. B. Peile.
A quantity of Reptiles......	Do.	Do.

Mr. J. H. Steel, A. V. D., then read a very interesting paper on Wild Horses, which will be found on page 253 in this number.

Dr. Kirtikar proposed a vote of thanks to Mr. Steel for his able paper.

PROCEEDINGS OF THE MONTHLY MEETING HELD ON 5TH SEPTEMBER 1887.

Dr. D. Macdonald presided.

The following new members were elected:—H. H. the Thakore Saheb of Lathi, Mr. M. Scott Stuart, Mr. S. D. Sassoon, Dr. Anna Moreshwar Kunte, Veterinary-Surgeon C. E. Nuthall, A. V. D., and Mr. N. Miller.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions to the Society's collections since last meeting:—

Contributions.	Description.	Contributor.
4 Birds' Eggs	Merula nigropilea	Mr. J. Davidson, C.S.
5 Sea Snakes	From Bombay Harbour	Capt. W. Aves.
1 Pangolin (alive)	Manis pentadactyla	Mr. H. M. Phipson.
12 Fossils	From Raipur, C. P.	Mr. J. A. Betham.
1 Fœtus of a dog	Curiously deformed	Mr. R. Tarkhad.
1 Peacock	Mounted	Dr. Kirtikar.
A quantity of Fungi	From Bombay	Do.
A quantity of Fish, Shells, Corals and other Marine Animals.	From Alibag	Mr. W. F. Sinclair, C.S.
Skeleton of a Dolphin	Do.	Do.
A quantity of Turtles' Eggs.	Do.	Do.
2 Muntjacs' Heads	Cervulus aureus	Do.
A number of Hermit Crabs.	From Aden	Mr. D. Bennett.
2 Flying Squirrels	From Cashmere	Capt. F. B. Peile.
24 Birds' Eggs	Do.	Do.
1 Snake	Bungarus arcuatus	Dr. Hojel.
1 Sea Snake	Enhydrina bengalensis	Mr. F. Grieves.
1 Gibbon	....	Victoria Gardens.
Several Bats	Megaderma lyra	Mr. W. F. Sinclair, C.S.
1 Domestic Duck (alive)	With curiously deformed feet.	Mr. H. Bulkley.
1 Mongoose (alive)	Herpestes griseus	Mr. W. W. Saunders.
1 Manura	Paradoxurus musanga	Mr. E. P. Close.

Minor Contributions.—From Mr. Fraser Hore, Miss Warner, Mr. J. Greenwood, Dr. Weir, Mr. G. H. Colomb.

Contributions to the Library.—Journal of Comparative Medicine and Surgery, from the editor, "Verhand lungen des Zoologisch Botanischen Gesellschaft in Wien," in exchange.

Mr. H. M. Phipson, the Honorary Secretary, then read a paper on the "Poisouous Snakes of Bombay," which will be found on page 244 of this number.

The Rev. Fr. Dreckmann, S.J., made some remarks about the distinction of the poisonous from the non-poisonous snakes. He first drew attention to the erroneous but widely spread opinion that all poisonous snakes have a broad triangular head and a slender neck. This was, no doubt, a characteristic of the viperine snakes, but they had it in common with the perfectly hamless tree-snakes, whilst the Elapidæ, which include the most deadly snakes in existence, in this respect looked very innocent The list of poisonous land snakes in the Bombay Presidency, about which there could be any doubt, was happily a very short one. There could be no difficulty about the cobra or the rare Ophiophagus. The two species of Callophis were so rare, led such an obscure underground life, and were so sluggish, that it was practically impossible to be bitten by them accidentally. For the others, the Bungarus, the Vipers and Tree-vipers, he proposed the following "rule-of-thumb":—

1. *Head broad, triangular and very distinct from neck.*—(*a*) Those with head covered with large shields or plates are harmless. (*b*) Those having the head covered with small scales are poisonous.

2. *Head scarcely distinct from neck.*—(*a*) Head covered with large shields and sub caudals (shields beneath the tail) single, poisonous. (*b*) Either head covered with

shields and sub-caudals double or head covered with scales and sub-caudals single harmless.

Dr. K. R. Kirtikar read a paper on the "Indian Hepaticæ," which is printed on page 250 of this number.

Dr. Macdonald, in proposing a vote of thanks to Mr. Phipson for his very interesting paper on the poisonous snakes, remarked as to the extreme practical importance of the subject. With reference to Dr. Kirtikar's note, he observed that much new matter had been clearly put together and well observed facts had been given, and that it rested with the members of the Society interested in the subject of Botany to still further investigate the subject.

A vote of thanks was proposed to Dr. Kirtikar for his contribution, after which the meeting dissolved.

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THE

JOURNAL

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

EDITED BY

R. A. STERNDALE, AND E. H. AITKEN.

With Rules and List of Members.

NO. I.—VOL. II.

Bombay:
PRINTED AT THE
EDUCATION SOCIETY'S PRESS, BYCULLA.

1887.

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Secretary—Surgeon K. R. Kirtikar, F.S.M. (France), F.R.C.S.

RULES

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

1. The Society shall be called the "NATURAL HISTORY SOCIETY OF BOMBAY."

2. Its object shall be the promotion of the pursuit of Zoology, Botany and Geology in all their branches.

3. Members shall be proposed, seconded, and elected by ballot. A majority of two-thirds of the members who vote shall be required to secure election.

4. Members shall pay an annual * subscription of Rs. 15, payable in advance. If any member's subscription remain unpaid for more than three months, his name shall be liable to be removed from the list of members after due notice given by the Secretary.

5. Members absent from India shall not pay for the period of their absence.

6. A President and three or more Vice-Presidents shall be elected from among the members resident in Bombay.

7. The President shall take the chair and conduct the business at all meetings of the Society, or in his absence, one of the Vice-Presidents. If neither is present, a Chairman shall be elected by the meeting.

8. A Secretary and Treasurer shall be elected from among the members resident in Bombay.

9. It shall be his duty to record the minutes and proceedings of all meetings of the Society, and to conduct all the details of business and carry on the correspondence of the Society.

10. The Secretary and Treasurer shall prepare an account of the receipts and disbursements of the Society to be presented at the annual meeting which shall be held in the month of January.

11. The ordinary meetings of the Society shall be held in Bombay on the first Monday of each month.

12. The chair being taken, the order of business shall be as follows :—

(*a*) The minutes of last meeting to be read and confirmed.

(*b*) The announcement and election of new members.

(*c*) The reading of letters and the discussion of any ordinary business of the Society which shall be before the meeting.

(*d*) The announcement of presents and donations.

(*e*) The remainder of the time at the disposal of the meeting shall be devoted to the reading of papers, communication of interesting facts, exhibition of specimens, &c.

13. Members having anything of this nature to bring before the Society, shall give the Secretary intimation before the commencement of the meeting (in the case of papers a full week before). The subjects of which such intimation shall have been given shall be taken up in such order as the Chairman may think best.

14. If necessary a Committee of Management shall hereafter be elected from the members of the Society resident in Bombay.

15. These Rules are provisional and may be amended or added to at some future time. One month's notice of any proposal to alter the Rules shall be given to the Secretary.

---

* For the calendar year.

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Mr. H. M. Phipson.

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Mr. F. G. Kingsley.

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6. A President and three or more Vice-Presidents shall be elected from among the members resident in Bombay.

7. The President shall take the chair and conduct the business at all meetings of the Society, or in his absence, one of the Vice-Presidents. If neither is present, a Chairman shall be elected by the meeting.

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(*a*) The minutes of last meeting to be read and confirmed.

(*b*) The announcement and election of new members.

(*c*) The reading of letters and the discussion of any ordinary business of the Society which shall be before the meeting.

(*d*) The announcement of presents and donations.

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14. If necessary a Committee of Management shall hereafter be elected from the members of the Society resident in Bombay.

15. These Rules are provisional and may be amended or added to at some future time. One month's notice of any proposal to alter the Rules shall be given to the Secretary.

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* For the calendar year.

THE

JOURNAL

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

EDITED BY

THE HON. SECRETARY.

With an Illustration.

No. III.—VOL. II.

Bombay:
PRINTED AT THE
EDUCATION SOCIETY'S PRESS, BYCULLA.

1887.

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RULES

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

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1. The Society shall be called the "NATURAL HISTORY SOCIETY OF BOMBAY."

2. Its object shall be the promotion of the pursuit of Zoology, Botany and Geology in all their branches.

3. Members shall be proposed, seconded, and elected by ballot. A majority of two-thirds of the members who vote shall be required to secure election.

4. Members shall pay an annual * subscription of Rs. 15, payable in advance. If any member's subscription remain unpaid for more than three months, his name shall be liable to be removed from the list of members after due notice given by the Secretary.

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EDITED BY

THE HON. SECRETARY.

No. IV.—VOL. II.

Bombay:
PRINTED AT THE
EDUCATION SOCIETY'S PRESS.

1901.

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